# MACHINERY

very important pack Jewels of Industry, Fafnir Super-Precision Bearings, are now wrapped in aluminum foil that affords unexcelled protection . . . and boxed in new gold-colored cartons that command special care in handling. The Fafnir Bearing Company, New Britain, Conn. THE MOST COMPLETE LINE IN AMERICA SUPER-PRECISION

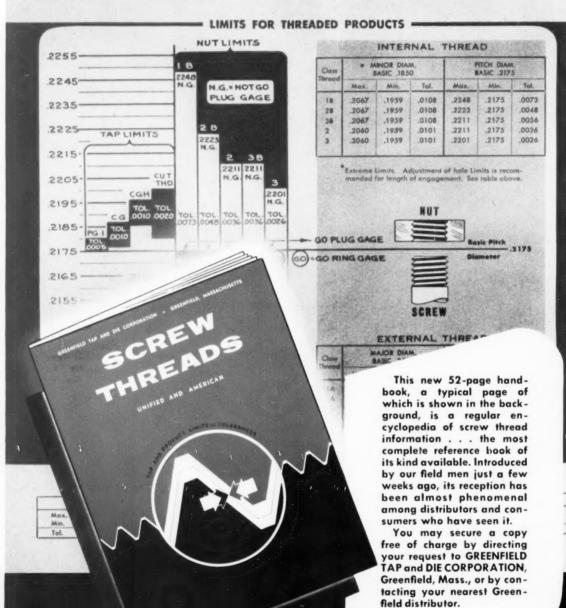
#### SUGGESTED TAPS and TAP DRILLS

TAP SU	GGESTED
Class of Thread	Туре Тар
18	Cut or CGH
28	CGH
38	CG
2	CG
3	PG1

	TAP DRILLS	
Negrest Av	ailable Comm	ercial Driffs
Decimal	Nominal	% Thread
Equivalent	Size	Depth will give
.1960	69	83
.2010	47	75
.2031	13,64"	72
.2055	45	69
.2090	64	63

Diameters	Max.	Min.
To 1/2 d incl.	.2013	.1959
above 1/2-3/3d	.2040	.1986
above %-11/1d	.2067	.2013
obove 11/2-3d	.2094	.2040

THEORETICAL F	PERCENTAGE
M Depth of Thread	Required Hole Size
83 1/5	.1959
75	.2012
70	.2046
65	.2078
60	.2111



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# **MACHINERY**

**VOLUME 60** 

**APRIL, 1954** 

NUMBER 8

The Monthly Magazine of Engineering and Production in the Manufacture of Metal Products

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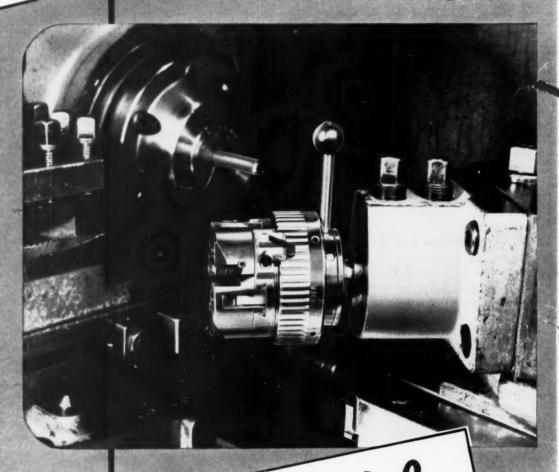
Product Directory 326



Advertisers Index 455—456 For Precision Threading The on TURRET LATHES

# -IMPROVED

- POSITIVE
- · MORE RIGID



see this
EQUIPMENT
at the
ASTE
Show
BOOTH 1738

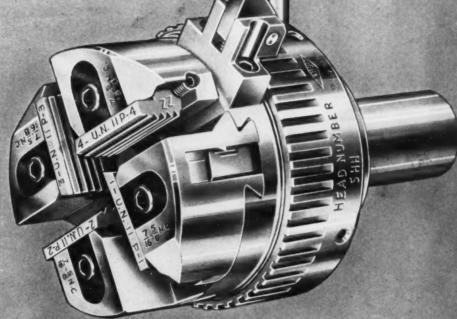
LANDIS HINE
MACHINE
LISTLY ANIA, U. S.

THE WORLD'S

LARGEST

# %" LANDMATIC HEAD

LOCKING ACTION



AN improved LANDMATIC Hardened and Ground threading head has been designed for use on turret lathes, hand-operated screw machines, and automatic screw machines employing a stationary head. The 5HH LANDMATIC is a stationary self-opening head, and will produce threads ranging from 1/4" to 3/6" in diameter. Its construction features two important Improvements in design—a positive locking action, and greater head strength.

The positive locking action is provided by a new size-adjustment mechanism. A pivoted latch is held in engagement with notches on the adjustment ring by spring tension. A movement of one

notch makes a corresponding adjustment of .001" on the pitch diameter of the workpiece.

The greater overall strength of this die head results from the increased thickness of the head body and its various parts. The new design allows this small die head to easily withstand the extreme stresses imposed when threading special alloy steels.

The 5HH LANDMATIC Head has a notably small number of working parts. All parts are made of special alloy steel, and are hardened and precision ground. Left-hand threads may be cut by using left-hand chaser holders and regrinding the same set of chasers. More information available on request.

EXCLUSIVE MANUFACTURERS OF THREAD GENERATING EQUIPMENT

THE Sallhout S LINE OF

@ ·

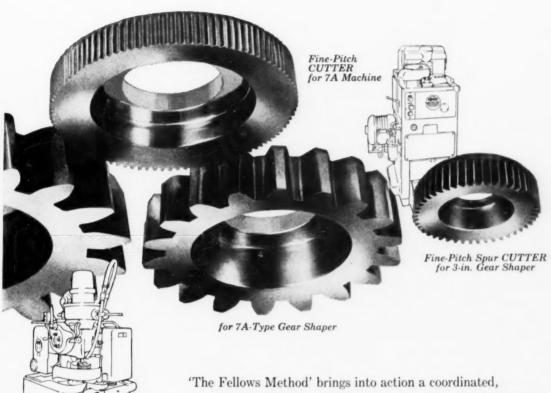
SPUR CUTTER for 6A Gear Shaper

SPUR CUTTER for 100- or 120-in. Gear Shaper

HELICAL CUTTER for 36-Type Gear Shaper

HELICAL CUTTER for 6A- or 7A-Type

# MACHINES AND TOOLS delivers Quality Control in All Sizes...

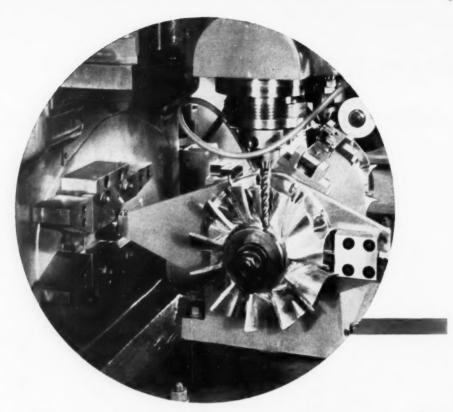


'The Fellows Method' brings into action a coordinated, balanced combination of machines and tools for roughing and finishing precision quality gears from  $\frac{1}{16}$ " to 120 inches. Each machine delivers its maximum production economies when tooled with Original Fellows Cutters. This unified responsibility has great practical advantage when costs depend on holding work to predetermined limits.

The Fellows Sales and Engineering Staffs at Branch Offices and at Headquarters are men of broad experience and practical skill in helping customers combine specified accuracy with close control of costs. All Fellows Offices are at your service.

#### THE FELLOWS GEAR SHAPER COMPANY

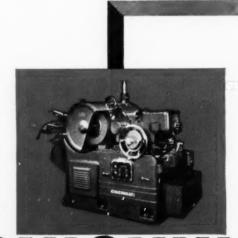
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Branch Offices: 319 Fisher Building, Detroit 2, Michigan • 5835 West North Avenue, Chicago 39, Illinois
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## Complete Production Package by

Do you have an idea for new low-cost methods in your plant? Or perhaps you have machining, forming or heat treating problems and do not know how to solve them. In either case, Cincinnati Engineering Service can give you the help you need. Our Application Engineers will develop your methods and production ideas, or develop methods from their own experience, with the objective of supplying you with the complete production package for the lowest cost of operation. Two examples of Cincinnati Engineering Service are illustrated here. Both are tooling applications on standard machines selected from our extensive line of products: Milling, Die Sinking, Broaching, Grinding, Lapping, Cutter Sharpening, Forming and Flame Hardening Machines. Our engineers will be glad to give you the benefit of their wide experience in reducing metalworking costs. Please include full particulars when inquiring.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO



CINCINN

MACHINES FOR MILLING, BROACHING, DIE SINKING, CUTTER SHARPENING, PRECISION GRINDING,

6-MACHINERY, April, 1954

**Complete Production Package** 

## CINCINNATI 16" Vertical Hydro-Tel

tooled up by Cincinnati

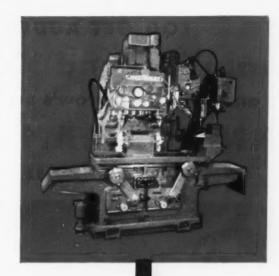
Part name..... Impeller

Material ..... Aluminum
Operation .... Automatically mill

profile around blades

Complete information on standard 16" Vertical Hydro-Tel may be obtained by writing for catalog No. M-1497-1.





## Cincinnati Can Help You Reduce Costs



Complete Production Package

# CINCINNATI FILMATIC No. 3 Centerless Grinder

tooled up by Cincinnati

Part name..... Universal joint spider

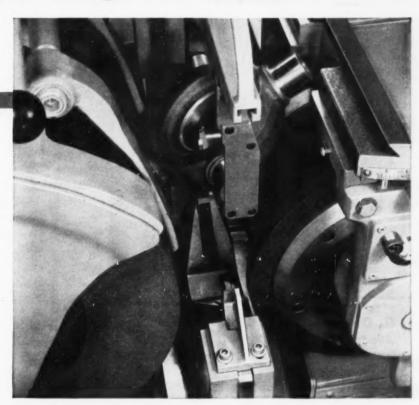
Material . . . . . Steel

Operation .... Grind two diameters

simultaneously

Complete information on standard No. 3 Centerless may be obtained by writing for catalog No. G-570-3.

ATI



LAPPING, METAL FORMING, FLAME HARDENING. OTHER PRODUCTS: GRINDING WHEELS, CUTTING FLUID

#### YOU GET ADDED

## "Flex-ability" and "Cut-ability"

Plus today's answer to tomorrow's problems with the new

# VAN NORMAN No. 28 RAM TYPE MILLER



VAN NORMAN Manufacturers of — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

## **VAN NORMAN** SPLINE and GEAR GRINDERS Cut Costs... **Increase Output**



wheels producing results in finish, accuracy and speed that increase production at reduced costs.

Van Norman machines will also grind internal and external helical or spur gears - straight, taper and helical splines. They may be adapted to shave splines.

Phone, wire or write Van Norman for assistance with your spline and gear grinding problems. Van Norman engineers, specialists in grinding, are immediately available.

Typical Parts Ground on Van Norman Spline and Gear Grinders

AN NORMAN CO., Springfield 7, Mass., U.S.A.

# Save Time on Your Grinding Setups One machine for all these jobs...



# LANDIS

precision grinders

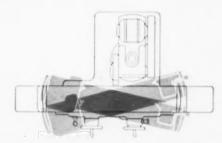
The Landis 12" x 28" Grindwell offers many operating features of larger Universal Grinders with savings in cost and floor space. Engineering Features: infinitely variable headstock speeds . . . live or dead spindle . . . two speed hand traverse and four speed power traverse . . . precision coarse and fine wheel feed . . . Microsphere wheel spindle bearings for high precision and fast spark-outs . . . swiveling headstock, wheelbase and work table.

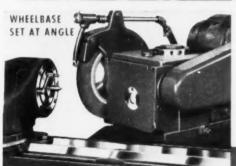


## **LANDIS Grindwell**

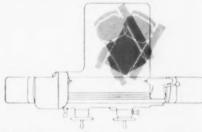
a low cost Universal Grinder designed for speedy setups and precision tolerances

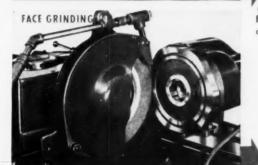




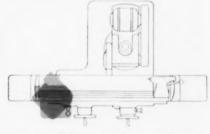


WORK TABLE SWIVEL—Calibrated scale at end of table for setting angle of taper grinding up to 24 included angle or 5" per foot. Center scale graduated for turning table 90 either direction.





GRINDING WHEEL SWIVEL—Calibrated scale so wheel head can be set for angle up to 90° in either direction to eliminate work piece interference or dress angle on face of wheel.





HEADSTOCK SWIVEL—Calibrated scale so angle up to 90° in either direction can be set for face grinding and tapered external or internal grinding of chucked work pieces.

For detailed features and specifications, write for Bulletin S-49.



LANDIS TOOL COMPANY

WAYNESBORO, PENNA., U.S.A.

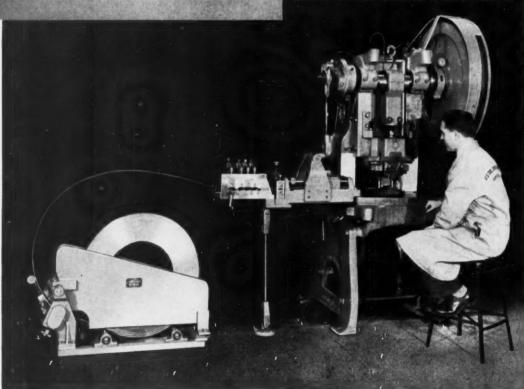


At left: The new ACC-1-9-B U. S.

Automatic Coil Cradle, showing

motor drive.

Below: The new U. S. Automatic Coil Cradle being used in a punch press set-up, together with a U. S. Slide Feed and a U. S. Plain Stock Straightener.



- **U. S. Automatic Coil Cradles**
- U. S. Slide Feeds

#### ALL ON DISPLAY AT BOOTH 1254 - A.S.T.E. EXPOSITION, PHILADELPHIA, APRIL 26-30

- **U. S. Plain Stock Straighteners**
- **U. S. Power-Driven Straighteners**
- U. S. Scrap Chopper

# AUTOMATIC COIL CRADLE

## SEE IT AT THE SHOW! Check its Ease of Loading Check its Speed of Operation

On display and in operation for the first time at the Tool Engineers Exposition—the newest U. S. Automatic Coil Cradle! If you are interested in press room "automation" . . . in making your press room operations faster and more efficient . . . be sure to visit the display of U. S. Automatic Equipment at Booth 1254.

This cradle has a capacity for material up to 9 inches in width, in coils with an O.D. up to 40 inches. It is equipped with two coil rest rolls mounted on self-aligning roller bearings. A pair of hardened and ground power-driven take-out rolls unwind the material to the very end of the coil. The ½ HP geared motor provides output up to 52 feet per minute, and is started and stopped through a mercury switch loop control. Motors can be furnished to provide even higher output if required.

One of the most outstanding features of the new Cradle is the design which makes loading an easy, high-speed operation. The photographs show how the unit has been designed with the coil rest rolls as close to the floor as possible. It is a simple matter to place a coil in position—without raising it to a considerable height, or removing and replacing retaining arms, as would be necessary if a stock reel were used. All these features add up to greater convenience, easier operation and greater output.

In addition to the new Coil Cradle, Booth 1254 will display a U. S. Slide Feed and a Plain Stock Straightener similar to the ones on the press in the lower photograph. You will also see two larger Power Driven Straighteners, another Automatic Coil Cradle, and the U. S. Scrap Chopper.

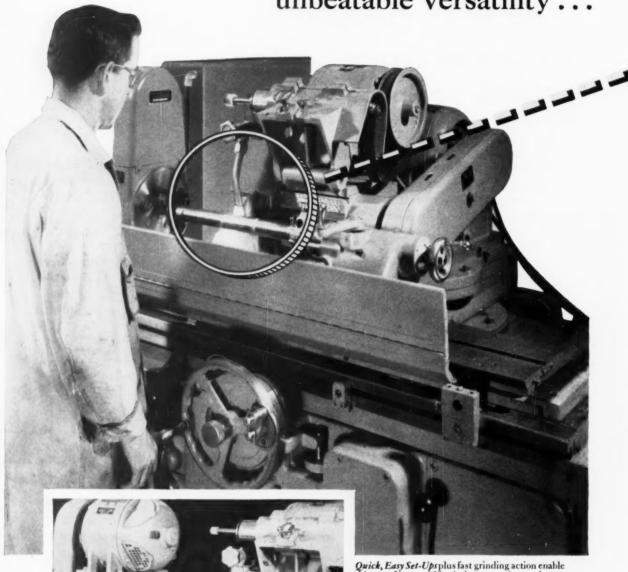
If you have a press room—and press room problems—be sure to visit Booth 1254. See U. S. Automatic Press Room Equipment in operation; talk to our engineers, and see if they can't suggest profitable, practical solutions to some of your production problems.

## U.S. TOOL COMPANY, Inc.

AMPERE (East Orange)

NEW JERSEY

# NEW Type U4 Norton Universal Grinders – 12"x 36" and 12"x 48" – feature unbeatable versatility...



Quick, Easy Set-Ups plus fast grinding action enable this new Norton 12" grinder to cut time and costs in a wide variety of external, internal, face and angular wheel feed grinding jobs. Here the internal grinding spindle is shown swung up and out of the way while a shaft is being ground.

Permanent Chuck Mounting is an outstanding advantage. Headstock spindle has a dog drive plate on one end. On the other is a 5" D-1 cam lock nose, on which you can leave a chuck mounted permanently — merely swiveling headstock 180° to start chucking jobs faster.



1

## Greatly simplified set-ups give you more time for grinding

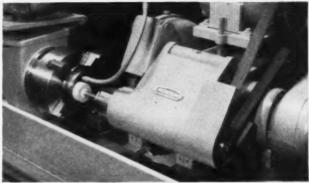
Double-barreled good news! The new Norton universal grinders are made in 12" x 36" and 12" x 48" work capacities!

Versatility keynotes the design, with feature after feature increasing the job range and cutting operating costs. For example, take the work speed range of 40 to 400 r.p.m. You get an infinite number of speeds over this wide range, simply by turning a dial.

Other important features are illustrated here. It will pay you to look them over carefully — and consider their advantages in your own production.

#### Get the whole story

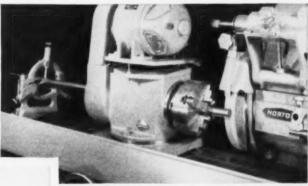
on the broad operational scope and fast, precision performance of these new Norton 12" grinders. See your Norton Representative, or write us direct. And remember: only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5.



For Quick Change-Over to or from internal grinding, the internal grinding spindle is permanently hinged to front of wheel slide. This also enables you to perform both internal and external grinding on a single workpiece without changing the set-up.



Settings At Any Angle are possible for both wheel and feed, independently, with this compound wheel head slide. Wheel head has swivels above and below the slide ways; upper wheel head member can be positioned to extend capacity when wheel head is swiveled.



Greater Shaft-Grinding Capacity is assured by the hollow spindle in the headstock. A 1½" hole clear through the headstock spindle permits passage of shafts that may be longer than the machine — another typical advancement that means greater versatility and usefulness.

To Economize, Modernize With NEW

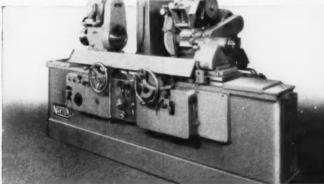


#### **GRINDERS** and LAPPERS

Making better products ... to make other products better

District Sales Offices: Worcester • Hartford • New York

Cleveland • Chicago • Detroit



Advanced Design includes combined lever and handwheel operated footstock, electrical controls grouped in raised cabinet, pumps and motors easily accessible, table-ways pressure-lubricated from outside reservoir, ramped outlet from coolant tank to assist clean-out.

The Results You Need in hole-accuracy and long life are realized from

MALLE MARKET PARTY OF THE PARTY

Here are the four principles of Winter Tap design and manufacture that result in Balanced Action:









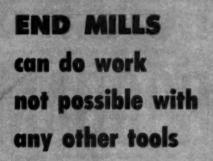


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Your local industrial Supply Distributor carries a complete stock of WINTER





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Mittingail

Don't wait...

Investigate

# KEARNEY & TRECKER'S TOOL-LEASE PROGRAM

...the common sense approach to your plant modernization problem

Here are a few of the many new Kearney & Trecker machines available for Tool-Leasing









ersal Mills Pla

Plain Mills

Vertical Mills

Production Mills

#### Here's the most significant opportunity ever offered machine tools users

In these times, modernization is the soundest approach to meeting increasingly competitive conditions. And the best way to modernize to improve products, cut costs, gain productive flexibility - is to retool with new machines. Today, Kearney & Trecker's new Tool-Lease Program offers you an unmatched opportunity to "junk the clunkers" that are nibbling away at your profits. It's time to act. Don't wait - investigate!

#### These are only a few of the advantages Tool-Lease offers you

In the first place, you can try out new machines in your own plant . . . without being obligated to purchase them. Secondly, you can get hitherto impossible flexibility and capacity to take advantage of changing production requirements without the risk of obsolescence. Last, but not least, you can expand production without tying up working capital, going into debt, or impairing future borrowing capacity.

#### Tool-Lease helps you get the exact milling or boring machines you need

Under Tool-Lease, you can rent any Kearney & Trecker standard knee or bed type milling machine or precision boring machines. If you require special machinery or heavy-duty CSM bed-types, special agreements will be considered.

Three basic plans give you varying options to continue or terminate the lease or purchase the equipment.

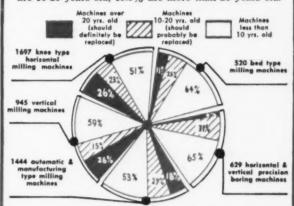
For complete details on Tool-Lease . . . help in analyzing your milling and precision boring needs see your Kearney & Trecker representative or mail coupon to Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.



C 1954

#### THE CRITICAL PICTURE OF CREEPING OBSOLESCENCE . . . AND HOW TO STOP IT

Let's take a typical basic industry as an example — Agricultural equipment. Of the 5199 standard knee type horizontal, vertical, bed and manufacturing milling machines and precision boring machines in use today — which could be replaced by Tool-Lease equipment—26% are 10-20 years old, 19.9% are more than 20 years old.



#### The picture is similarly startling in 15 additional basic industries

The Agricultural Equip. and 15 other industries listed are using 150,825 standard knee-type horizontal, vertical, bed and manufacturing milling machines and precision boring machines. 18% are over 20 years old, 38% are 10-20 years old. How do you stand in your industry?

20 yrs. old (should definitely	Machines 20 yrs. old (should less than probably 10 yrs. old
Construction, mining & oil well equip.	Motor vehicles & parts
//38%// 23%	69%/ 18%
Metalworking machinery	Complete aircraft
32%/ 22%	//36x/Ax
Special industry machinery	Aircraft engines, propellers & parts
///35%/ 28%	///3/4///
General industrial equipment	Railroad equipment
/25%/ 22%	///34%/// 16%
Office & store machines	Fabricated metal products
32%	/544// 18%
Demestic & service equipment	Shipbuilding, ordnance & miscel.
//35%//13%	///45%///14%
Electrical equipment	Precision mechanisms
397/ 19%	//24//11%
Miscel, machine parts & jobbing	Figures for this presentation adopted from 1953 McGraw-Hill survey of metalworking industry

1514 A break-down on your industry will be furnished on specific request.





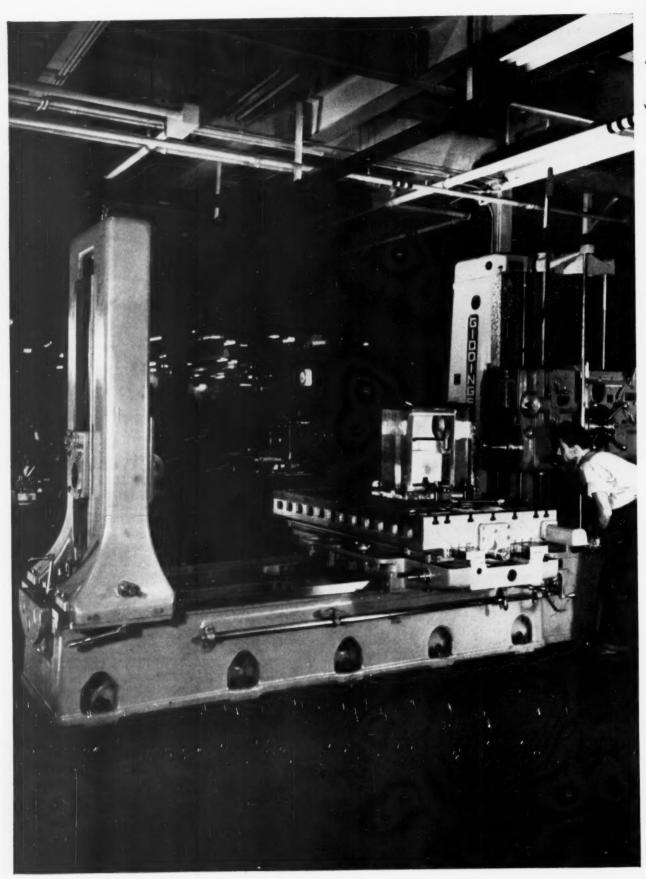
**Autometric Precision Boring Machines** 

Kearney & Trecker Corporation 6784 W. National Ave. Milwaukee 14, Wis.

Please send me Bulletin TL-10A with details on the Tool-Lease Program.

Check here if you would like to have a representative call on you as soon as possible (or call Milwaukee, GReenfield 6-8300).

Name
Title
Cempany
Address
City Zone State



20-Machinery, April, 1954

# Pace-setter... often copied, never equaled

This G&L 340-T Horizontal Boring, Drilling and Milling Machine...like all G&L tools...is highly versatile, superbly built. And it's years ahead of its time in design

Compare horizontal boring machines feature by feature, advantage by advantage. Study the quality of their construction, the basic components and accessories or attachments available. You'll soon discover why the table type G&L 340-T is unmatched in its class for capacity, versatility and long-lived precision.

From its 4" dia. spindle to its simplified gear change and direct-reading dials—the 340-T's advanced design gives you 45 faster, easier speed selections from 10 to 1300 rpm. You have the option of standard or built-in rotary tables in several sizes . . . standard or increased working lengths of

bed or columns. Hardened and ground bed and saddle ways are standard.

Further, the 340-T can be equipped with the G&L Automatic Electric Positioning device for simplification of close-tolerance sequence operations from a single setup. In fact, with a 340-T, you get the exact machine for your work — a machine that feature for feature, advantage for advantage cannot be matched.

For complete details on the 340-T or 350-T (5" dia, spindle) table type Horizontal Boring, Drilling and Milling Machines — contact your G&L representative or write for catalog No. 30-T.



## MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty machine tools — Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Openside Planers; Planer Type Milling Machines; Vertical Boring Mills; and Davis Cutting Tools

# 1736 Link-Belt helical gear drives chosen for Texas' newest pipe mill

# Special, extra-thick cast steel housings withstand heavy shock loads at Lone Star Steel

Only the finest drive can deliver efficient, long-life operation under high temperatures . . . heavy, continuous loads . . . frequent, severe impact. That's why A. J. Boynton Co., designing and supervising engineers, approved the use of Link-Belt helical gear drives at Lone Star Steel.

And, because Link-Belt builds all drive components-speed reduction units, couplings, shafting, bearings and baseplates—the complete installation is pre-integrated. All dimensions are correlatedassuring accurate alignment and maximum performance.

Next time you've a demanding speed reduction



LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office: New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

veyor units, the Selas normalizing furnaces and the Sutton rotary straighteners. In addition, Link-Belt supplied chains, roller bear-

bett supplied chains, foller bear-ing steel pillow blocks, geared flexible couplings, fluid, worm, herringbone and P.I.V. variable speed drives for this important installation.

# **DUAL FIXTURING**Solves Grinding Problem

TWO Surfaces Ground in ONE Operation

Wide variety of parts now ground on one machine



With rotary work carrying fixture



With feed-thru fixture



JOB DATA

MACHINE Gardner 125-26" Precision Double Spindle Grinder

TOOLING Rotary Work Carrying Fixture on Front Feed-thru Fixture on Rear (illustrated)

PRODUCTION On pieces (illustrated), 30 to 50 pieces per minute, .030 to .075" overall stock removal

TOLERANCES .0005" for flatness and parallelism; .002" for uniformity

WORK HANDLED Rocker brackets
Crankshaft sprockets
Timing gear sprockets
Pump covers

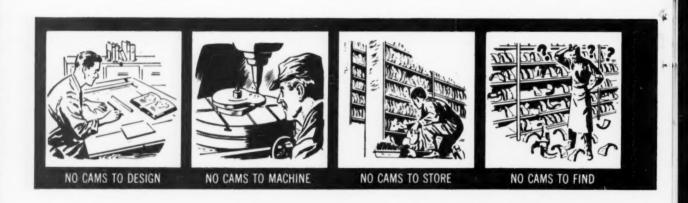
If you need fast, economical production of flat surface parts, send us blueprints for production estimates and tooling suggestions.

GARDNER MACHINE COMPANY 414 Gardner St., Beloit, Wisconsin, U.S.A. GARDNER

processor Grinders

# No CAM WORRIES

with Warner & Swasey Multi-Spindle Automatics



YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY

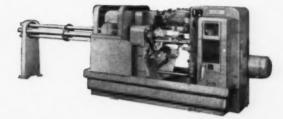




NO CAMS TO CHANGE



IT'S SIMPLE TO SET UP



**Automatic Bar Machines** 

1¾" Standard Capacity 2¼" Oversize Capacity

and now, newly introduced

3/4" Bar Capacity
11/4" Bar Capacity

Automatic Chucking Machine 6" Swing

● Just make a simple setting on a Warner & Swasey—and there you have your new feed stroke, clearly indicated on a graduated scale. Yes, it's as easy as that! All feed strokes are quickly available for both longitudinal and cross slides. No more need to sacrifice cycle time because the "right" cam is not on hand or because a cam change would take too long. You always get your exact feed stroke quickly on Warner & Swasey Multi-Spindle Automatics.



MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

COST REDUCTION

thru

continuous

broaching

of multiple

parts

• Wherever metal is removed on duplicate small parts you are apt to find a place where Footburt Surface Broaching Machines can cut manufacturing costs. Production is high, and tool maintenance is low in cost per piece. We have had many years of experience in designing the tooling for various types of parts and will gladly advise you in applying surface broaching to your work.

THE FOOTE-BURT COMPANY . Cleveland 8, Ohio

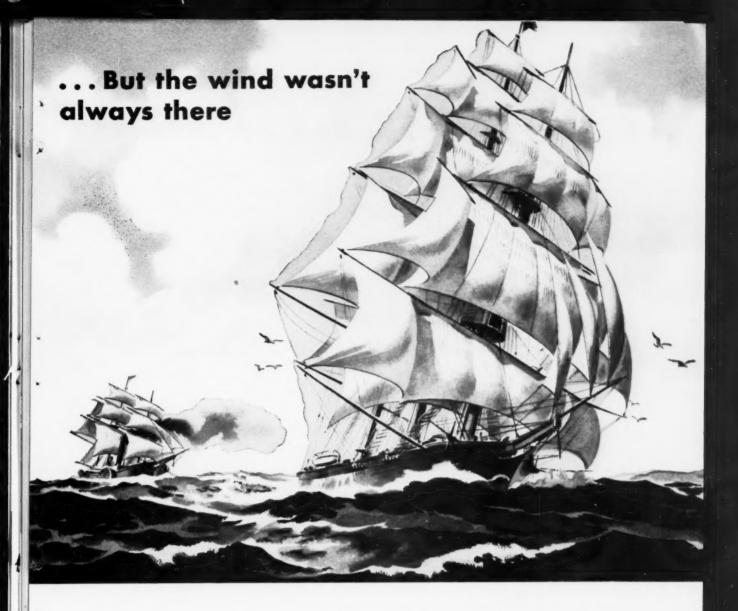
**Detroit Office: General Motors Building** 



Holding fixtures are designed for quick, convenient loading, with automatic clamping and unclamping.

FOOTBURT

MACHINE TOOLS



N THE Clipper ship era of the 1840's 20 knots with a favoring wind was considered good time — as indeed it would be today. But the wind wasn't always there. In the long run steam won out in the competitive race.

We say, "That's progress" but it's really competition which makes the difference between historic failures and continuing success. In the case of the Clippers something better, more dependable came along — and it will always be that way.

Like everyone else in today's highly competitive market you're certainly looking for new ways to improve product quality and cut manufacturing cost. Very possibly we here at Heald can help. Heald automatic sizing, constant feed throttling, centerless grinding, faster cycles, versatility, transfer type Bore-Matics, battery type equipment and a host of other unique Heald features for faster,

better precision finishing are available for a wide variety of jobs. We would welcome the opportunity to show you how a fresh Heald viewpoint can help — on long or short runs, single or multipurpose setups.

Competition is wonderful when you're ahead of it. Our business is to keep you there. That's why IT PAYS TO COME TO HEALD.



#### THE HEALD MACHINE COMPANY

WORCESTER 6. MASSACHUSETTS

Offices in Chicago • Cleveland • Dayton
Detroit • Indianapolis • New York
Internal and Rotary Surface Grinding Machines and Bore-Matics

# ... another BIG one!

Yes, it's a big one, but Consolidated builds them larger and also smaller.

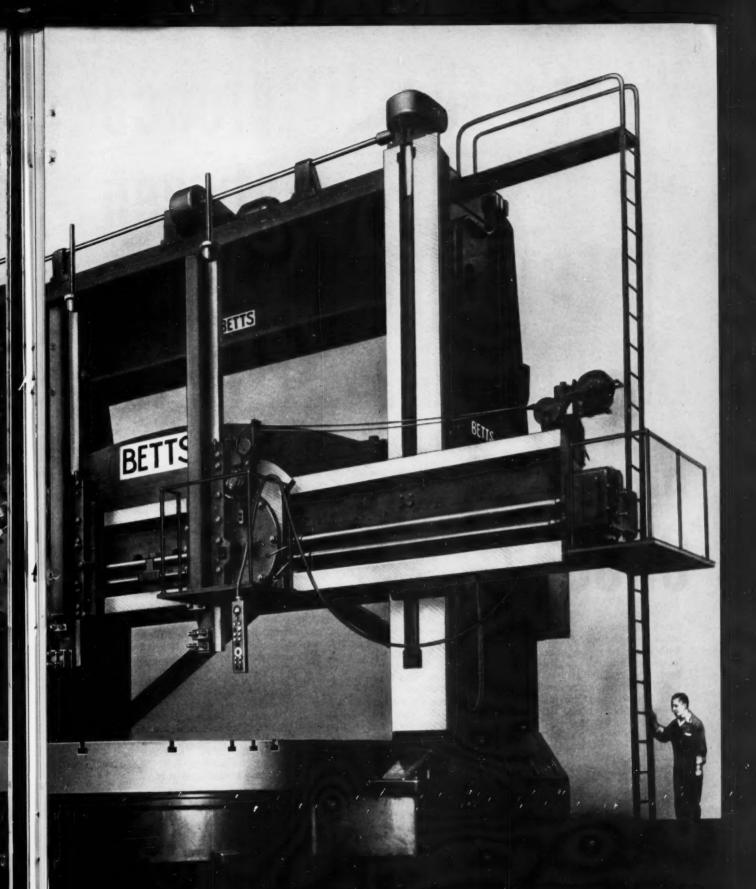
But more than bigness is the quality of the engineering thinking that goes into Consolidated Machine Tools. For example, on this 20 Foot BETTS Vertical Boring Mill, there isn't a single gear shift lever on the entire machine! Gear changing and all other operating functions are performed 100% from the pendant switches at the cutting tools.

In Consolidated Machine Tools you get tomorrow's engineering today!

BETTS 20-FOOT VERTICAL BORING MILL

CONSOLIDATED MACHINE TOOL

Wholly owned subsidiary of Farrel-



CORPORATION, ROCHESTER, N.Y.

Birmingham Company, Incorporated

# What's the difference between a PERMANENT MAGNET CHUCK and an ELECTRO-MAGNETICS CHUCK? Which One Should You Use?

Some swear by one, some by the other - but there's a difference, both in the way they operate and in the holding jobs each does the best.

A Taft-Peirce Superpower Permanent Magnet Chuck has a built-in power supply of special alloy magnet material. Extremely powerful, yet controlled simply by moving a hand lever, the holding power won't fade with use.

Since a Superpower P-M Chuck has no wires to fail - no current to heat - it's the safest, most economical choice for many jobs. Portable. Versatile. It's ideal for many grinding, light milling, planing, shaping, and benchwork jobs.

A Taft-Peirce Superpower Electromagnetic Chuck gets its power from a DC line. Slightly more powerful, size for size — it throws flux farther, gives greater flux penetration to permit mounting parts well above the face plate.

In addition, it is somewhat more adaptable to unusual holding problems where complex face plate design may be required, involving such elements as special contour, grooving, or slotting.

There are, of course, applications where one does a better job than the other. Since we make them both, we're completely impartial. We'd be glad to advise you which is the best solution to your problem. Write today. (And ask for Catalogs describing the many types and models available.)









THE TAFT-PEIRCE MANUFACTURING COMPANY . WOONSOCKET, RHODE ISLAND



## Tests Prove That CIMCOOL With "95-16" Doubles Rust-Control

The good news is being flashed coast-to-coast. Actual scientific laboratory and shop tests prove that adding "95-16" to CIMCOOL° doubles rust-control as compared with a formula without this amazing ingredient.

And while doubling rust-control, this radically new and different coolant—this chemical emulsion—saves you money many other important ways. Plant after plant reports that CIMCOOL covers 85% of all metal cutting jobs . . . and does a better job. It permits faster speeds because it combines friction reduction and cooling capacity in a degree never before attained by old-fashioned coolants. It's longer lasting in machines. So

CIMCOOL reduces downtime and cuts labor costs for cleaning and changing.

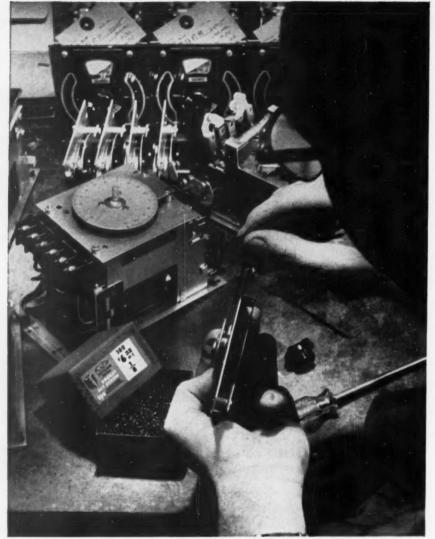
We invite you to prove to yourself what scientific tests and on-the-job experience have already proved. Put Cimcool to the test in your own plant—on your own machines. For a demonstration write, wire or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

\*Trade Mark Reg. U.S. Pat. Off.

# CIMCOOL

for 85% of all metal cutting jobs

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.



UNBRAKO Self-Locking Socket Set Screws are used to hold the Vernier-Set or Cycle-Progress cam on the shaft of this precision timing device. Once they are tightened, they maintain the accurate setting so important to the operation of the instrument.

### You can lower your inventory by using Unbrako Standards—stocked by your distributor

You'll have less money tied up in inventory, you'll get personalized service, faster deliveries. In addition, you'll reduce assembly time and increase production with these precision industrial threaded fasteners. Write for Unbeako Standards—a complete listing of socket screw products made by SPS and stocked by your local distributor. STANDARD PRESSED STEEL Co., Jenkintown 19, Pa.



Because they are so tiny, the UNBRAKO set screws are picked up and started in the tapped hole with the long arm key.



The compactness of the design of the timing device makes it necessary to turn the screw in prior to assembly. The uniform depth and size of the hex socket permit maximum torquing, speed assembly.



UNBRAKOS—made of heat treated alloy steel—have fully formed threads, Class 3 fit; have knurled cup point for positive locking. Are available in standard sizes from #4 to 1".



SOCKET SCREW DIVISION





GIDDINGS & LEWIS

KEARNEY & TRECKER

MICROMATIC HONE

LEES-BRADNER

FELLOWS

CROSS

LE BLOND

ALLEN-BRADLEY CONTROL PANEL

This LeBland lathe has an Allen-Bradley control panel in cabinet at end of lathe. There are 20 components of which 14 are Allen-Bradley relays, contactors, and starters.

Allen-Bradley solenoid controls have ONLY ONE MOVING PART. No pins, pivots, or bearings to rust and stick. They are good for millions of trouble-free operations. That's why A-B controls are a sales asset to any machine tool.



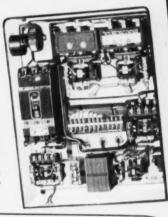




### ALLEN-BRADLEY CONTROL PANEL

This Gorton milling machine has an Allen-Bradley sequence control panel in the machine frame with 6 A-B solenoid-operated relays and starters, all equipped with silver alloy contacts that require no maintenance.

The ITE circuit breaker is interlocked with the door handle, which must be in OFF position to open cabinet. This is an important safety feature. Specify Allen-Bradley... and be safe.



# TROUBLE-FREE CONTROL PANELS FOR ALL TYPES OF MACHINE TOOLS

Today ... more and more machines are being "factory-equipped" with Allen-Bradley control planels. Why? Because Allen-Bradley solenoid relays and contactors are so simple ... ONLY ONE MOVING PART ..., they assure maintenance-free service for years.

## ALLEN-BRADLEY

MOTOR CONTROL

#### ENGINEERED TO FIT YOUR NEEDS

Machine tool panels, designed and built by Allen-Bradley, provide dependable, automatic sequence control of machining operations . . with split-second accuracy. Allen-Bradley control panels are all tailormade to get the greatest output from machine tools of every type. Your near-by Allen-Bradley sales engineer will gladly discuss your control requirements.

Send for Bulletin
ALLEN-BRADLEY CO.
1316 S. Second St., Milwaukee 4, Wis.



3-54-R

## QUALITY COMPONENTS

#### FOR MACHINE TOOL **CONTROL PANELS**





**Bulletin 350** Drum Switch



Bulletin 600 mall Motor Starter



**Bulletin 609** 



matic Motor Starter



**Bulletin 702 Solenoid Contacto** 



All components of Allen-Bradley control panels, like relays, contactors, starters, timers, fuse clips,

or terminal strips, are long-established units in

the A-B line. But while they have been field-

tested in thousands of applications, they still are

continuously tested during manufacture. That's how A-B control maintains its reputation for

Allen-Bradley Co., 1316 S. Second St.

Milwaukee 4, Wisconsin

Quality. Specify Allen-Bradley.



**Bulletin 891 Fuse Clips** 



Bulletin 200 D-C Relays





**Bulletin 713** Starter and Cir. Breaker



Starter and Disc. Switch

Limit Switch



**Bulletin 849** eumatic



Bulletin 895



**Bulletin 892 Terminal Blocks** 

ALLEN-BRADLEY

TROUBLE-FREE MOTOR CONTROLS



#### COMPLETE ACCESSORY EQUIPMENT

No. 104 Cutter Sharpener: Fully automatic wet grinding—angles easily set and maintained—simplified set-up and changeover.

No. 13 Tester: Practical running check provides precise testing over a wide range of gear specifications. Brake load and multi-speed drive simulateactual operating conditions.

#### No. 104 Straight Bevel CONIFLEX® Generator

\*FROM 16 DP TO 3 DP, 81/2" DIAMETER, 13/8" FACE

Newly developed to generate better bevel gears and pinions faster at lower cost. Cuts many sizes with minimum set-up time, few cutters. Cam-actuated generating roll insures maximum efficiency in the cutting cycle. Ideal for volume or short-run production.

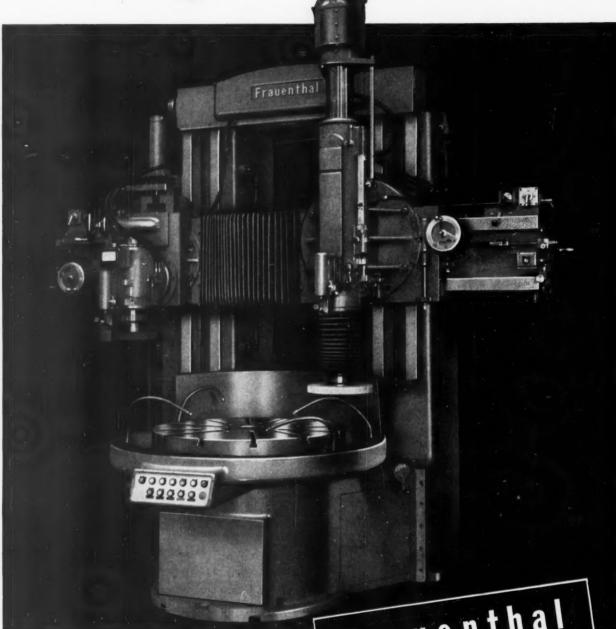
#### BULLETINS ON REQUEST

For all bevel gear design and production problems, Gleason Engineering Service is available throughout the world. Please submit prints and complete data.

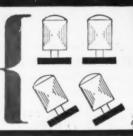
**GLEASON WORKS** 

BUILDERS OF BEVEL GEAR MACHINERY FOR OVER 85 YEARS 1000 UNIVERSITY AVE. • ROCHESTER 3, NEW YORK

# Grinding to MILLIONTHS



Many combinations of spindle positions for simultaneous grinding on all sizes of Frauenthal Grinders



Frauenthal SUPER-PRECISION Grinders PRECISION ORIND INSIDE, OUTSIDE AND FACES

# of an inch precision with Frauenthal Grinders

IMPOSSIBLE!... said one machine tool man
UNBELIEVABLE!... said another, skeptically
SHOW ME!... said a progressive executive

THIS is what we have shown many: You can get such super-precision grinding with these unique grinders that the normal method of expressing tolerances in tenths-of-thousandths of an inch became inadequate when precision was attained to fractions of tenths-of-thousandths, expressed best in MILLIONTHS of an inch.

#### AND THIS IS PERFORMANCE-PROOF... details on request

	MAX. VAR. IN	FACE THE	CKNESS		MAX. VAR. IN	WALL TH	ICKNESS
Station Reading		Station	Reading	Station	Reading	Station	Reading
1	.000000"	7	.000000"	1	.000000"	7	+.000020"
2	+.000010"	8	+.000020"	2	+.000010"	8	+000010"
3	+.000030"	9	+.000030"	3	+.000020"	9	.000000"
4	+.000030"	10	+.000030"	4	+.000020"	10	000010"
5	+.000030"	11	+.000030"	5	+.000010"	11	000020"
6	+.000010"	12	+.000020"	6	+000020"	12	000010"
Maxin			GAUGE REA		um Variation i	-	icity: .000040
MAX. OUT-OF-ROUND ON O. D.			MAX. OUT-OF-ROUND ON I. D.				
	Reading	Station	Reading	Station	Reading	Station	Reading
Station			00000N	7 .	.000000"	10	000110"
	.000000"	4	000050"	/ /	.000000	10	.000110
	.000000"	5	000050"	8	.000000"	11	000070"

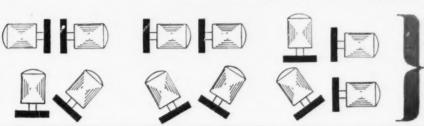
### Frauenthal Division

What is YOUR grinding problem?

We'll be glad to work with you on difficult grinding, boring, turning problems. A wide variety of combination grinding of outside and inside diameters or faces can be made SIMULTANEOUSLY to assure utmost precision and unfailing interchangeability of parts. Adaptations for specific jobs also can be engineered into these grinders for high production at low cost.

	ssential J.I.C. 1	S conforming to pecifications			
SERIES	TABLE SIZES	MAXIMUM SWING			
	30"	60"			
1800	36"	60"			
1800	42"	60"			
	48"	60"			
2000	60"	72"			
2000	72"	88"			
	110"	120"			
2200	120"	130"			
2200	130"	140"			
	140"	150"			

THE KAYDON ENGINEERING CORP. . MUSKEGON, MIGHIGAN



Bulletin

# How to Cut the Cost of Gaging Threads

#### with TAFT-PEIRCE JOB-RATED GAGES

The best gage for most jobs provides the best combination of speed, wear-resistance, upkeep, and initial cost. Here are some comparisons that will help you keep costs to a minimum.

### Thread Plugs

Plug Gage. Standard hardened steel gages are lowest in initial cost and are preferable when soft or moderately hard materials are being inspected in limited quantities. Taper-Lock up to 1.510". Reversible from #0 to 1/4". Reversible Tri-Lock above 1.510".

T-P Electrolized
Geges. With only a
modest increase in initial,
cost, substantially longer
wear life can be obtained with
this exclusive surface treatment.
Many users report up to 3 times
longer gage life.

T-P Carbide
Thread Plug Gage.
For exceptional resistance to abrasion or scratching and maximum wear life.
Furnished in both standard and special sizes — from #8 machine screw size up.

### Rings & Snaps



T-P Thread Ring Gages. Lower in initial cost than other gages for external threads, they check a combination of all thread errors but cannot distinguish between them.



T-P Adjustable Thread Snaps. Faster than ring gaging, and just as accurate, they check lead, angle, and all other thread elements. Pitch diameter is variable.



T-P Roll Thread Snaps. Same as adjustable, with rolls for gaging members. Since gaging members rotate, wear is spread over greater surface and service life increased.

#### Special Gages



T-P Rotochek (Flexible Sheft Model). Fastest thread gaging method yet devised. Push—and the gage screws into the work, Release the pressure and it stops. Pull—and it disengages. Can be used with most standard T-P plug or ring gages.



T-P Retechek (Bench Medel). Permits bringing work to gage, instead of gage to work. Like fexible shaft model, records indicate it triples rate of parts inspection.

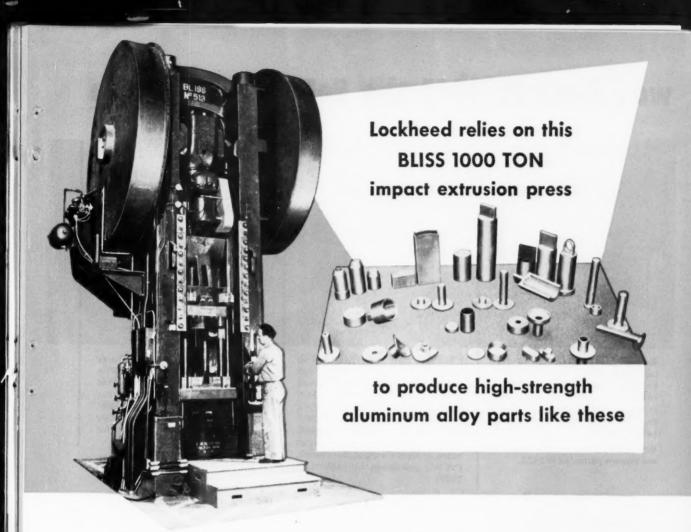


T-P Thread Concentricity Gage. Typical of the infinite variety of special gages made to order by T-P every year. This one checks size and location of internal threads.

For the complete story on these items and many more, send for your copy of the Taft-Peirce Handbook.



THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, R. I.



#### and saves thousands over conventional machining methods

This press, largest of its kind in the aircraft industry, has saved Lockheed up to 75% in time as compared to machining, and up to 90% in material.

In fact, Lockheed engineers estimate that transfer of only 15 parts from conventional machining to impact extrusion will mean savings of \$52,000 a year.

Lockheed's experience proves the importance of picking the right press for the job. And we honestly believe that our engineers are best equipped to help you make that choice. In representing Bliss—who makes more types and sizes of mechanical and hydraulic presses than any other company—they represent the world's largest press builder. Unparalleled skills and experience stand behind each Bliss press recommendation.

If you have a press problem—from a single press to an entire press room—consult a Bliss engineer or write directly to address below.



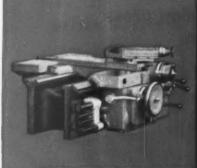
on your press is more than a name...it's a guarantee

E. W. BLISS COMPANY, Canton, Ohio PRESSES, ROLLING MILLS, SPECIAL MACHINERY

Subsidiary: The Die Supply Company, Cleveland, O. • E. W. Bliss (England) Ltd., Derby • E. W. Bliss Company (Paris) France
U. S. Plants in Canton, Salem and Toledo, Ohio; and Hastings, Michigan. Branch Offices in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New
Haven, New York, Philadelphia, Rochester, Toledo; and Toronto, Canada. West Cast Representatives: Moore Machinery Co., Los Angeles and San
Francisco; Star Machinery Company, Seattle. Other representatives throughout the world.

#### way back in 1941 the LeBlond RT Lathe

13 years ago, LeBland's RT Tool Room Lathe with these major



Satin-smooth Power Rapid Traverse to the carriage and cross slide plus pick-up traverse to the tailstock. No jerking, jolting or jumping. Gives you the most in operator convenience as an integral part of the apron. First developed by LeBlond in 1935.

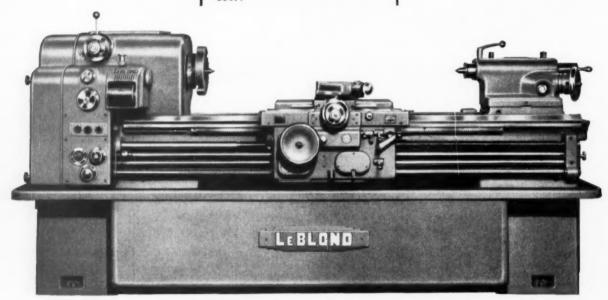
Automatically Positioned Leadscrew and Rod Supports perfected in 1923.



A Universal Quick-change Box with 90 feeds and threads in two ranges. You can cut from 120 threads to 1/4 thread per inch — without setting pick-off gears, mounting a sub-head or using any other attachment. Diametral pitch threads, leads in inches, millimeter leads and module pitch leads also can be cut by making a slight gear change. Put into production by LeBlond in 1937.



Autometic Chasing Stop, used primarily for cutting threads, limits cross slide travel positively and accurately. Makes possible speedy chasing, since cross and length power rapid traverse can be used to bring cross slide quickly back to exact starting position for each pass.



#### Condensed RT Lathe Specifications:

Swing over bed and carriage wings	181/2"
Swing over compound rest	111/2"
Distance between centers, base length	. 30"
Spindle speeds, range, rpm	
Low back gear	6 to 60
High back gear 30	to 300
Direct belt drive 150 to	o 1500

Feed and thread changes	60 regular 30 coarse
Feeds, range	.0007 - 2.064 ipr
Threads per inch, range	2 - 120 regular 1/4 - 1/8 coarse
Floor space required	96" x 48"

#### had today's Most Wanted Features



RT Combined Feed Apron with built-in Taper Attachment achieved in 1939. Cuts gradual or steep tapers with the larger dimension either towards the tailstock or headstock—without special machine set-ups.

An Exclusive Off-set Handwheel Tailstock employing a worm-and-rack construction for positive-position locking, greater operator convenience plus Hollow Tailstock Spindle adaptability. Equipped with a direct-reading spindle travel indicator.

And in 1946, the Variable-voltage Speed Control was incorporated into the head to provide over 300 spindle speeds in three ranges controlled by a single lever.

After five years in development and four years of on-the-job testing in LeBlond's production line, Industry met for the first time the 16" RT Tool Room Lathe at the 1947 National Machine Tool Show. There the RT's spectacular features—far ahead of their time—caused a flurry of comment about its amazing versatility. This lathe could do almost anything.

Only within the last few years have tool engineers throughout the lathe industry built into their lathes those features of the LeBlond RT Lathe that were "new" back in 1935... in 1937... in 1941... in 1946. Features that made the RT Lathe famous for the ability to handle almost any job without time-wasting special machine set-ups. Even in 1947, there were many who felt their tool room requirements were not varied enough for them to take full advantage of the RT's vast potential.

By adopting those early RT features on their current models, lathe makers acknowledge the greatness of LeBlond's RT Tool Room Lathe, conceived almost 18 years ago.

THE R. K. LEBLOND MACHINE TOOL CO., CINCINNATI 8, OHIO

For a detailed description of the LeBlond 16" RT Tool Room Lathe and the lower-priced 16", 16-speed RT Engine Lathe, send for Bulletins RT-31D and HD-31D

turned faster by



WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES-FOR OVER 64 YEARS.

For more information on products advertised, use Inquiry Card, page 261

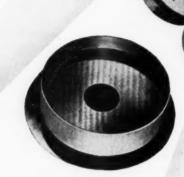
MACHINERY, April, 1954-41

#### Tiny?

Yes! The No. 11 Blanchard Surface Grinder grinds these ladies' watch gears, pinions and ruby bearings flat and parallel, and to a dimension tolerance of .0002".

#### Smooth?

Of course! The Blanchard No. 11 finished this refrigerator plate, seen through an optical flat, to 3 micro inches and flat within 1 light band (.0000118").



#### Accurate?

Sure . . . and easy, too! This Blanchard grinds 84" forged steel rings flat within .0002", parallel to .0002", dimension tolerance of  $\pm .0005$ ", and with surface finish of 4 micro inches.



#### Tremendous?

Yes...but fast! This 88" diameter cast-iron plate was ground on a No. 42-72-84 Blanchard in 3½ hrs., floor to floor. ¼" of stock—1520 cu. in.—380 lbs, was removed.

If you produce flat surfaces, your best bet is Blanchard Grinders with Blanchard Wheels!

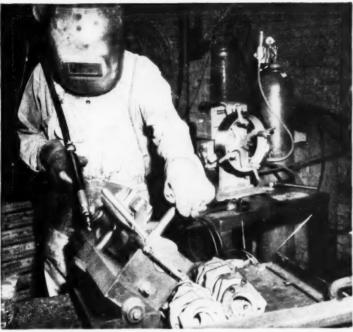


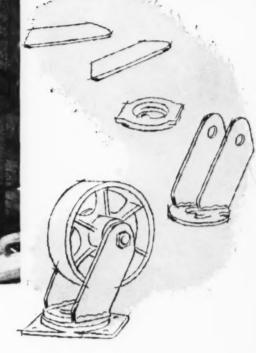


Send for your free copies of "Work Done on the Blanchard", fourth edition, and "Art of Blanchard Surface Grinding".

#### THE BLANCHARD MACHINE CO .\_

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.





#### SIGMA WELDING BOOSTS STEEL FABRICATION 100%

A manufacturer of steel truck casters, has doubled his production from 400 to 800 units a day—by changing to sigma welding.

Average welding speed is 120 in. per minute—Once clamped, the parts are welded in less than <sup>1</sup>2 minute.

**Used as welded**—Free from spatter and flux entrapment, the need for finishing is eliminated.

**Cut costs**—Fewer production steps have made possible labor savings up to ½ the former costs.

Sigma welding is just one of the welding processes developed by Linde's research and years of experience. Heliarc,

sigma, and UNIONMELT welding form a top notch fabricating team which is now setting a new peak in industrial production. For small shops or huge production lines, from carbon steel to complex alloys and non-ferrous metals—there is a LINDE electric welding process to do the job efficiently and economically. Your local Linde representative will help you determine the best welding process for your job. Call him today for more information.

#### LINDE AIR PRODUCTS COMPANY

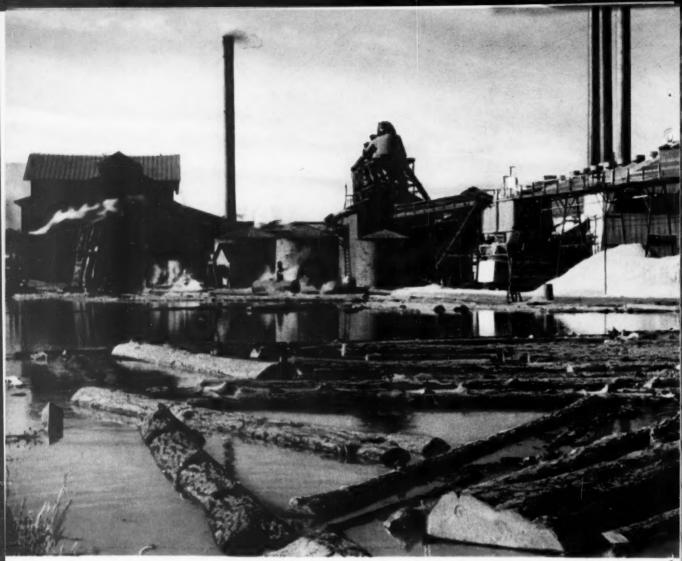
A Division of Union Carbide and Carbon Corporation 30 East 42nd Street • New York 17, N. Y. Offices in Principal Cities

In Canada: DOMINION OXYGEN COMPANY
Division of Union Carbide Canada Limited

"Heliars," "Unionmelt" and "Linde" are registered trade-marks of Union Carbide and Carbon Corporation







Western Pine Sawnull in Arizona



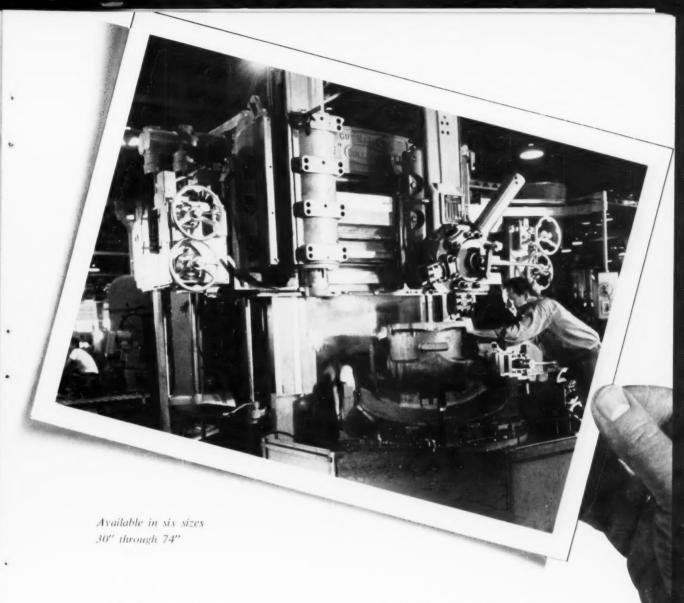


The
Invisible
Background
of
Industrial
Progress

When most of us think of Arizona, "The Grand Canyon State," we are reminded of its dry climate, rich mineral mines, rodeos, Hoover Dam, the greatest man-made water barrier in the world, and nature's wonderful spectacle, The Grand Canyon.

Yet, there are 3,607,000 acres of available commercial timber in Arizona which includes Douglas and White Fir, Engelmann's Spruce and Ponderosa or Western Yellow Pine. Ninety percent of this forest acreage is in Ponderosa Pine which is converted to a soft, fine-grained, inexpensive wood — in great demand for sashes and doors, flooring and general millwork.

As an efficient method of manufacturing for builders of material handling equipment for the lumber industry, *Modern Machine Tools* are indeed "The Invisible Background of Industrial Progress."



Vision is indispensable to industrial progress. Are you planning today for tomorrow's needs? If you are, you must pay particular attention to the machine tool requirements of your plant to meet the standards of today's manufacturing efficiency.

The Bullard Cut Master Vertical Turret Lathe is a machine designed for cutting time on cuts as well as cutting time between cuts. Truly everything its name implies -

and more. Designed to give maximum production on short or long runs by controlled accuracy, necessary rigidity and metalremoving ability.

It will pay you dividends for years to come. For the entire cost-saving, money-saving story, call your Bullard representative or write to The Bullard Company, 286 Canfield Avenue, Bridgeport 2, Connecticut phone 6-2511.















# ITS QUIET because it's SUPER-SONIC!

Chicago Pneumatic's new CP-3008 is a really quiet airpowered screwdriver. Its Super-sonic exhaust changes sound waves to a frequency which approaches the limit of human hearing. Of rugged, all-steel construction, it weighs only 1 lb. 14 oz. . . . has a side outlet exhaust deflector that rotates and locks in any position for directional exhaust. Has built-in speed control for precision driving on delicate work. Torque can be easily adjusted without special tools. Handles #4, #6 and #8 screws . . . will handle some #2's and #10's. Write for Bulletin SP-3096. Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.

#### See Them In Booth 1330 ASTE Industrial Exposition

- Super-sonic Screwdriver
- · New Air Powered Reciprocating Saw and File
- . Hydraulic Riveting and Punching Equipment

#### Chicago Pneumatic

PNEUMATIC TOOLS - AIR COMPRESSORS - ELECTRIC TOOLS - DIESEL ENGINES - ROCK DRILLS - HYDRAULIC TOOLS - VACUUM PUMPS - AVIATION ACCESSORIES

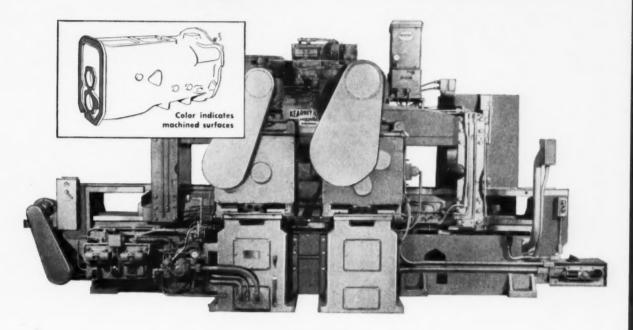
46-MACHINERY, April, 1954

For more information on products advertised, use Inquiry Card, page 261

# What a saving...



**Builders of Precision and Production Machine Tools since 1898** 



#### For the customer... it combined four milling operations in one machine!

THIS special 6-spindle transfer type milling machine was designed and built to keep a tractor manufacturer's production line rolling at high speed. The machine now mills opposing end faces of tractor transmission cases both flat and parallel... to close tolerances (.002) ... in only 94 seconds.

FOUR HYDRAULICALLY RETRACTING HEADS... First two heads have two spindles each for roughing.

Second two heads have one spindle each for finishing. CLAMPING MECHANISM... Large hollow workpiece is secured at each machining station by a tunnel-

type hydraulic equalizing clamping fixture. This eliminates the distortion usually encountered when clamping this type of workpiece.

If you have problems that require special machinery—contact your Kearney & Trecker representative,

Capacity . . . Experience . . . Performance
Upon completion of this \$5,200,000 expansion of our
Special Machinery Division, we offer you (1) unmatched facilities, (2) experience based upon
more than 50 years in the design and production of special machinery, and (3)
performance, best recommended
by our outstanding record of successfully solving many hundreds
of unusual machining problems.



ask for Data Sheet No. 1002. Free booklet, "Doorway to a proven method for solution of big and small metalworking problems," is also yours for the asking. Write today to SPECIAL MACHINERY DIVISION, KEARNEY & TRECKER CORP., 6784 West National Ave., Milwaukee 14, Wisconsin.

KEARNEY & TRECKER CORP. · Special Machinery Division

# Carlton:

#### TRANSMISSION BODY CASTING

Present running and set-up time: 5.25 hours Provious running and set-up time: 7 hours

#### 1st OPERATION:

#### and OPERATION:

Bore 4 holes to tolerances a .0003", drill, tap, reem and counterbore 11 holes.

#### Size: 14" x 13" x 20% "

Material: Semi-steel Weight: 250 lbs.



CARL

CINCINNATIC

#### THE PRODUCTION RADIAL DRILL

Carlton radial drills, properly tooled, will lower costs over the horizontal method

Drilling and boring accurately located holes isn't usually considered a production operation for a radial drill. However, when fitted with master trunnion and appropriate jigs, Carlton radial drills do this work accurately, quickly and on a production basis!

The transmission body shown here is a perfect example of production hole drilling on a Carlton. Using this set-up, many more operations are performed in the Carlton radial drill . . . at a terrific saving in handling and running time over the previous method.

Previously the transmission body was processed with the horizontal boring method included. The new tooling set-up worked out by Carlton engineers effected a 25% savings by circumventing the boring operation previously done in a horizontal plane. Using the horizontal method, the transmission body had to be handled four times . . . now it's handled but twice!

And Carlton radial drills are perfectly suited to production drilling. The pushbutton control simplifies and speeds up operation. The low hung drive assures the necessary rigidity. And the accuracy and precision with which the Carlton column clamp performs eliminates the need for operator to clamp and unclamp the column until the boring bar moves freely in the pilot bushings, thus assuring long life to boring bar and pilot bushings.

Carlton engineers will be glad to work with your engineers in recommending the most efficient tooling for your Carlton radial drill... to show you how the radial drill can be a real production machine tool, particularly if it's a



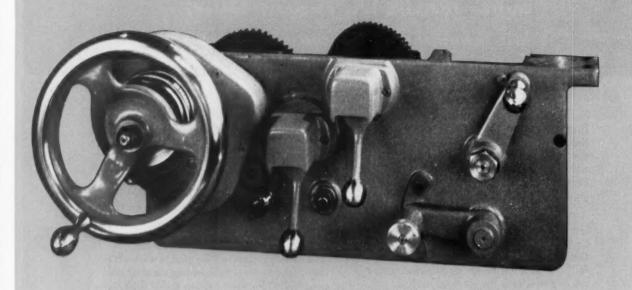
THE CARLTON MACHINE TOOL CO. Cincinnati 25, Ohio, U. S. A.

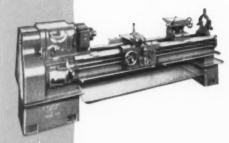
# CARLTON ENGINEERED TOOLING SET-UP 1 Carlton 3-A radial drill 2 Master trunnion 3 Jig 4 Boring bars

Gentlemen:		
Have your re	representative call and show us	that
Carlton is th	he production radial drill.	
	•	
Name	,	

Transmission body casting







- 1. All-geared headstock
- 2. 12 spindle speeds in geometric progression
- One-shot lubrication of carriage ways and cross slide
- 4. Ground bedways (flame hardened at extra cost)
- 5. Tapered key drive spindle nose
- 6. Multiple-disc clutch and brake
- 7. 32 thread and feed changes
- 8. Forged steel spindle and all headstock shafts mounted in precision antifriction bearings

For complete catalogs, prices and name of your local dealer, write on company letterhead to Cincinnati Lathe & Tool Co., 3267 Disney, Cincinnati 9, Ohio.

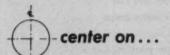
#### **A Quality Lathe Apron**

A glance tells you it's built for convenience and safety. There are two spindle start-stop levers, one located on the apron, for ease of operation. The chasing dial is built in. The independent drop levers for cross and longitudinal feed, lift to engage. This disengages feed if an object falls on them. For extra convenience, the oil shot plunger is also located on the apron.

#### is Standard on 16" Cincinnati LT Lathes costing only \$4829\*

The wide range of work these lathes will handle, plus their low initial and maintenance costs, assures a fast return on your investment. They are the only low-priced lathes in their class with high-priced features:

\*16" x 30" including motor and controls F. O. B. factory. Prices subject to change without notice. Direct reading length dist shown is evallable at extra cost.



cincinnati lathes and drills

There is also a complete line of Tray-Top Lathes and Cincinnati Floor, Bench and Radial Drills



Light-duty Tray-Top Lathes (10" to 18" swing)



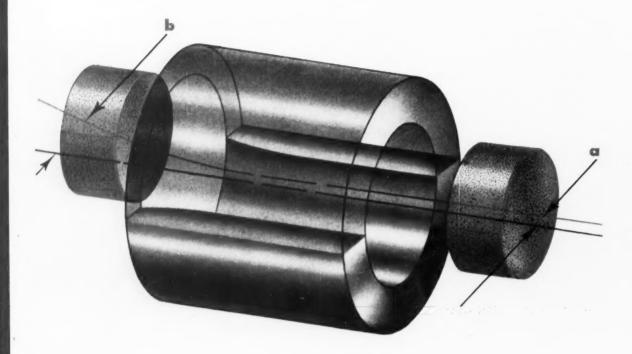
Radial drills (3' arm, 7" column)



Drilling machines, floor and bench (sizes 16", 18" and 21"; illustrated, 21" slider)

### alignment

#### for better internal grinding

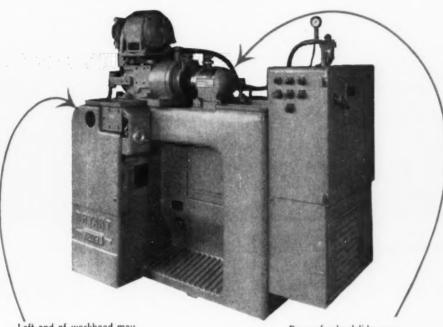


BELL mouth holes are a common internal grinding error. General available information advises simply turning the workhead or changing the length of traverse to correct this error, to generate a straight hole. In the case illustrated above, where bell mouth exists at one end of the hole, neither turning the workhead nor changing the length of stroke will correct this error.

In order to grind a straight hole the wheel must traverse the work in a straight line parallel to the axis of the work. The wheel path (the line in which the wheel traverses) is controlled by the slides under the wheelhead. If the slides are straight and true, the wheel path will be a straight line. If the path of the wheel varies from a straight line, the variation will be generated in the work.

At point "a" the wheel path and axis of the work are perallel and the wheel is set to grind a straight hole. Because of an error in the wheelslide

ways, the wheel path is distorted and the wheel is plunged into the back end of the work and the wheel path and work axis diverge as shown at point "b". Wheelslide error can introduce distortion of many types within the work in addition to the one illustrated. The remedy is to correct the wheelslide ways which will, in turn, straighten the wheel path. The wheel contact will be improved, resulting in better finish.



Left end of workhead may be raised or lowered to bring its axis into a plane parallel with wheelslide bar.

Rear of wheelslide may be adjusted to insure straight line motion of the wheel.

This machine is designed particularly for high production, precision grinding of bores up to 3" in ball bearing races, gears, rolls, bushings, etc. Operator merely loads work, trips a valve to start cycle and unloads the finished piece. The machine automatically rough grinds, finish grinds and returns to chucking position when finished size is reached. Wheelslide traverse is hydraulically operated, providing infinite traverse speeds and assuring smooth oscillation. Wheel speeds up to 100,000 R.P.M. are obtained with the Bryant Hi-Frequency Wheelhead. Write for folder on the Bryant No. 1209 Machine.

Write for "Alignment" booklet which gives complete Actails on this interesting subject. Also ask for booking form on new sound, color movie — free showings arranged for engineering groups.

#### Bryant Chucking Grinder Co.

Springfield, Vermont, U. S. A.

Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates



For Atlantic Automatic Co., Cleveland, Ohio:

#### **Tool Life Increased Over 200%!**



PARTS FOR GEARS & CAR TRANSMISSIONS are just a few of the many delicate machine tool products Atlantic turns out. Cities Service Chillo Cutting Oil has helped Atlantic maintain their great reputation for quality products.

For the services of a Cities Service Lubrication Engineer... Write Cities Service Oil Company, Sixty Wall Tower, New York City 5, New York.



"Cities Service Chillo Cutting Oil Has Proved To Be The Difference Between Ordinary And Quality Production In Our Shop!"

Here's Atlantic Automatic's story in their own words: "One of our tougher jobs recently was machining SAE 446 Stainless Steel with two forming, one threading and three drilling operations. The critical operation was drilling a .025 inch diameter hole, ½ inch deep. The drill would soon pack with chips and break. When a Cities Service Lubrication Engineer was called in, he recommended our using Chillo 44.

"This light-colored oil did the trick. DOWN TIME WAS CUT IN HALF AND DRILL LIFE INCREASED OVER 200%!

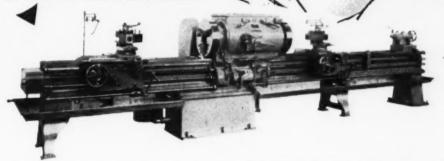
"We use Cities Service Chillo 44 to machine all types of metals covering a range of machinability from brass to stainless on our Brown and Sharpe 00G, 0G and 2G Automatics. It has proved to be the difference between ordinary and quality production in our shop!"



### DOUBLE-ENDER HYDRATROL LATHES

18" x 13 foot x 6 foot Double-End Hydratrol, hollow spindle, Engine Lathe; with  $7\frac{1}{8}$ " hole in spindle; having hardened ways and a 10" long spindle extension. Equipped with carriages on both beds. Arranged for power feed and thread cutting. Tailstock for additional work between centers.





Double-End Hydratrol Lathes are built in sizes from 18" with holes up to  $7\frac{1}{8}$ " to larger sizes with holes to suit the job. Double-End operations avoid necessity for resetting the work, and insure relative concentricity of boring and turning operations and squareness of faces at both ends.

50" swing—50 foot length, 19" hole in spindle. 24" Hexagon Turret on carriage with profile bar for profile boring and grinding. Retractable diamond profile wheel dresser. Weight 72,000 lbs.



GRAND at CHOUTEAU . ST. LOUIS 3, MO.



Fresh Oil

BY THE MEASURED DROP

the most dependable method of lubrication ever developed! This lubricator becomes an integral part of a machine tool in which there are 48 vital bearings that require dependable lubrication. The Madison-Kipp mechanism is so compact that the reservoir measurements are only 4" wide, 19¾" long by 5¾ high."

There are six different models to meet almost every application requirement. Please write us for all details regarding your particular lubricator requirements.

MADISON-KIPP CORPORATION
203 WAUBESA STREET • MADISON 10, WISCONSIN

kipp

• Skilled in Die Casting Mechanics • Experienced in Lubrication Engineering • Originators of Really High Speed Air Toets

56-MACHINERY, April, 1954

For more information on products advertised, use Inquiry Card, page 261

#### when the odds don't have it...

Before putting the chips down it is well to realize that reliable machine performance is largely dependent on well balanced tooling. If it is a multiple spindle bar automatic, an even number of work spindles provides a better opportunity for balance than an odd number.

Odd or even, the work spindles are only one of many important considerations in the selection of an "automatic". Other factors also important to the individual machine user are suggested by the new Conomatic

General Datalog. Copies are now available.

#### data for comparison

Part Levelling Screw Machine 15/8" Six Conomatic Tools 100% Carbide Tipped Material B-1112 Stock Size 1" Round Work Spindle - 958 R. P. M. Opposed Spindle - 677 7.25 Seconds per Cycle Time

3.6 Seconds per Piece

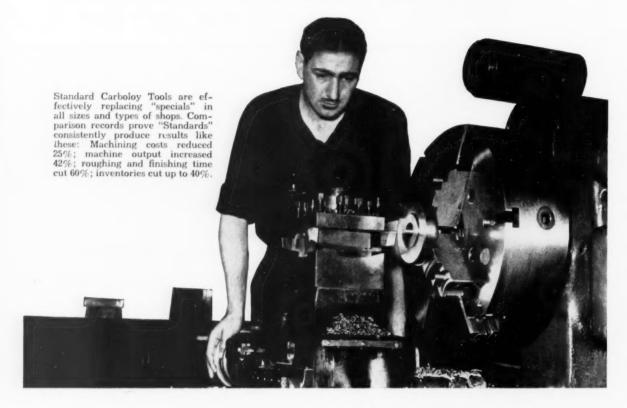


ACTUAL SIZE

Conomatic | CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

#### STANDARD CARBOLOY, TOOLS

reduce inventory, increase output, cut production costs on single-point tool jobs



Just eleven Standard Carboloy Tools — styles A to G — will do up to 80% of all single-point tool jobs . . . outlast steel tools by as much as 10 to 1. Use them "as is" for

turning, facing, boring . . . or adapt them quickly to your own "specials."

By using "Standards" you'll eliminate hundreds of costly, inventory-loading special tools. You'll slash downtime to an absolute minimum. Your local Authorized Carboloy Distributor can always give you immediate delivery on all Standard Tools and blanks, insert blanks and boring tools.

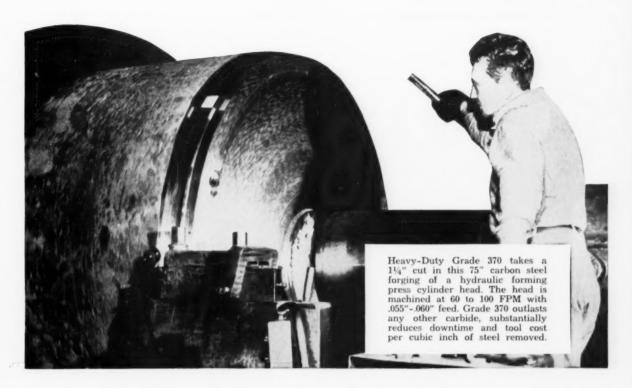
Standard Carboloy Tools are available to handle every single-point tool job. Send coupon, today, for free technical literature.

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

# CARBOLOY Department of General Electric Company 11147 E. 8 Mile Street, Detroit 32, Michigan Send me the following, without cost or obligation: Application data on Grade 370. Brief-A-Log" Condensed Catalog and Price List, GT-265, with "Standard" specifications. Have a tool expert call to show us how to use "Standards" effectively. Name Position Company

#### NEW CARBOLOY GRADE 370

cuts more cubic inches of steel per minute with longer tool life—than any other carbide



New Heavy-Duty Grade 370 Carboloy cemented carbide was specially developed for taking heavier cuts in steel, at higher speeds than ever before practical. Grade 370 cuts more cubic inches of steel per minute — with longer tool life — than any existing carbide.

Other carbides fail when machining at higher speeds because the tremendous temperatures and pressures deform their cutting edges. Heavy-Duty Grade 370, manufactured by an entirely new process, has a built-in rigidity to resist this deformation, even at temperatures of around 1800° F.

Carboloy Grade 370 is being used successfully on such tough, heavy-duty appli-

cations as rolls, gun barrels and locomotive wheels. Grade 370 lasts longer than any other carbide—increases production by as much as 30%.

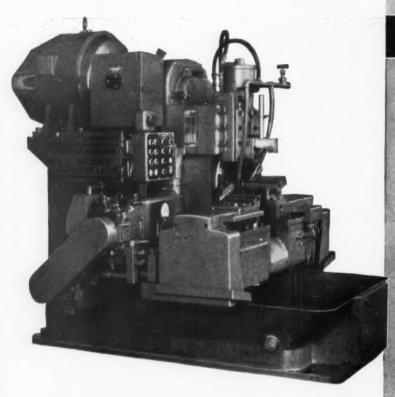
The first of the new Series 300 steelcutting carbides, Heavy-Duty Grade 370 is available immediately in a number of sizes and shapes. Trained engineers from the Carboloy Engineering Appraisal Service will work with you on your heavy-duty cutting jobs. Send coupon, at left, for information, and for free technical literature.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

#### **BARDONS & OLIVER**

#### MILL TYPE CUTTING-OFF LATHES

✓ FULLY AUTOMATIC FOR COUPLING WORK
✓ SEMI-AUTOMATIC FOR CROPPING WORK



#### ADDITIONAL SIZES OF BARDONS & OLIVER CUTTING-OFF LATHES

No.	32 -	Capacity	from	1/4"	dia.	to	2" dia.
			11				
No.	34 -		11	3/4"	dia.	to	4" dia.
No.	35 -		11	1"	dia.	to	5-5%" dia.
No.	36 -	- "	11	11/2"	dia.	to	65%" dia.
No.	38 -	- 11	11	23/8"	dia.	to	85/8" dia.
No.	39 -	- "	11	23/8"	dia.	to	95/8" dia.
No.	312 -	_ "	"	41/2"	dia.	to	12¾" dia.
No.	316 -	_ //	"	65%"	dia.	to	16" dia.

We also manufacture a complete line of Turret Lathes

#### FEATURING

#### HIGHER SPEEDS AND GREATER POWER

#### INCREASED PRODUCTION

- Spindle speeds up to 300 R.P.M. with up to 30 H.P. motor
- More rugged, dependable double tool slides
- ☼ Increased chucking power

Optional Extras

- Automatic or semi-automatic outside and inside chamfering attachments
- Speed accelerating device for cutting off solid bars
- Automatic stock loading tables
- Automatic stock unloading tables

BARDONS & OLIVER, INC.

1135 WEST 9TH STREET

CLEVELAND 13, OHIO

## 6 Cost Cutting Abrasive Ideas to Cut Your Grinding Costs

Combined Smooth-Deep-Corrugated Wire-Lokt Disc

Smooth section for initial shear cut, corrugated for fast, cool stock removal.

Round Center Wire-Lokt Cylinder for surface grinders

Gardner adapters permit fast, accurate mounting and eliminate wasteful stubs.



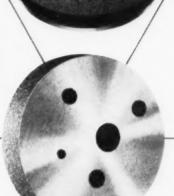
Square Center Wire-Lokt Cylinder for surface grinders

Patented construction has four shearing edges for heavy stock removal.



Sectional Wire-Lokt Disc

Large diameter discs in separate sections for easy handling and mounting.



Smooth Surface Wire-Lokt Disc

For general purpose grinding on soft steel and cast iron.



Deep-Corrugated Wire-Lokt Disc

For fast, cool cutting on large areas, thin parts or tough metals.



118A

- \* Wire-Lokt Safety Construction
- \* Tailored to Your Grinding Needs
- \* Bonds for Wet or Dry Grinding
- \* For All Standard Types of Mounting
- \* Nation-wide Abrasive Engineering Service

Your local Gardner Abrasive Man is ready to help you. Write and we will have him call at your plant.

GARDNER MACHINE COMPANY

414 Gardner Street Beloit, Wisconsin



Tough
centerless
grinding
problem



got you UP



Here's the grinding wheel that will ABSOLUTELY solve it!

Stop fretting and fuming! CINCINNATI Grinding Wheels can help you get off that limb in a hurry . . . because CINCINNATI Wheels go with centerless grinders like bark on a tree.

And with a Cincinnati Milling-trained machinist on the job to help you get the most out of CIN-CINNATI Wheels, you can count on the *right answer* -FAST! Here's why:

CINCINNATI Grinding Wheels were developed by Cincinnati Milling, which, in the field

of centerless grinders, has done more research, had more experience and made more machines than any other organization in the world.

Using CINCINNATI Wheels, we've solved hundreds of centerless grinding problems—such as production, roundness, taper, sizing, stock removal and finish.

CINCINNATI Grinding Wheels represent 25 years of Cincinnati Milling research and practical experience based on an entirely new approach to grinding wheels—the development of the grinding wheel as a true cutting tool.

We are so confident—so absolutely sure—that CINCINNATI Grinding Wheels can help solve your tough centerless grinding problem that we make this unconditional offer: either you must be completely satisfied, or we will make no charge for the CINCINNATI Grinding Wheel used.

So contact us at once. We'll send one of our expert machinists—men who are Cincinnati Millingtrained and know grinding and grinding machines as well as grinding wheels. He can show you how to get the most out of CINCINNATI Grinding Wheels and help you solve that tough centerless grinding problem. There is no charge for his service. Write, wire or phone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

How CINCINNATI GRINDING WHEELS Solved Tough Centerless Grinding Problem



The job

Metering pin for aircraft landing gear. Grind 17 3/8" length, including two tapers and one straight section.
Maximum diameter .406".
Material SAE 4130. Stock removal .050" - .075".

The machine

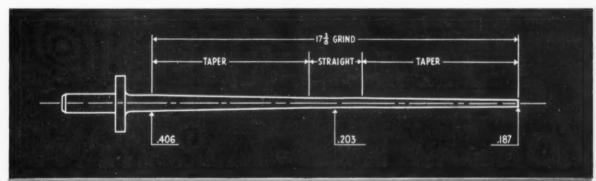
Cincinnati No. 3 Centerless.

The problem

To grind this long, slender part, removing a large amount of stock, without distortion or warping and produce a high finish without chatter marks.

The solution

A Cincinnati 2A60-M5-VN wheel provided the free cutting action necessary to keep the heat low. A Cincinnati Milling-trained machinist worked out the grinding technique "on the job." The large wheel used - 24" x 17½" x 12" - was manufactured in one piece.

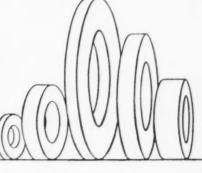


Here's a tough centerless grinding problem that had production men in a tail spin. The problem was how to grind this long, siender metering pin for aircraft landing gear, removing a large amount of stock, without distortion or warping and produce a high finish without chatter marks. For solution — see Case History.

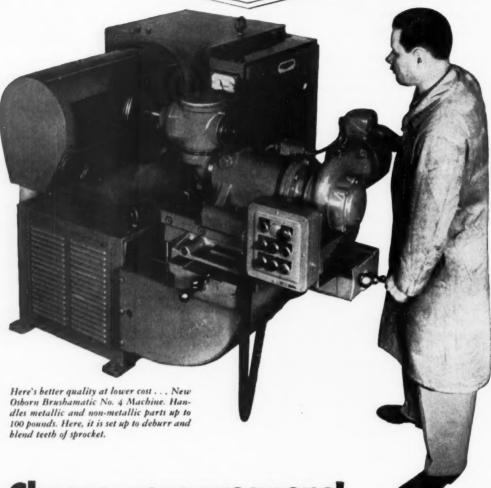


THE CINCINNATI MILLING MACHINE CO.

Cincinnati 9, Ohio







**Choose your weapons!** 

HOW are you going to answer the challenge of competition when it comes to your deburring and finishing operations? By hand? Or, by machine... with the Osborn Brushamatic? You'll far outclass the old manual deburring department in quality of work and in economy when you convert to Osborn's automatic power brushing.

At the push of a button, Brusha-

matic machines remove burrs and feather edges, blend surface junctures and clean parts thoroughly. Results are absolutely uniform . . . piece after piece. Scrap loss is nil. Service life of part is increased through elimination of stress-concentrating scratches. And it turns out work about 5 times as fast as hand methods.

Find out how you can apply this

modern method to your production. Call your nearby Osborn Brushing Analyst or write The Osborn Manufacturing Company, Dept.D-16, 5401 Hamilton Avenue, Cleveland 14, Ohio.

#### INFORMATION:

Write today for your copies of booklets on Automatic Deburring and on Brushamatic Machines.



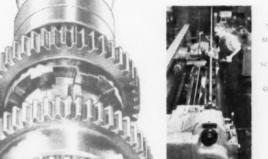
SEE IT AT OSBORN BOOTH 627, ASTE SHOW

Osborn Brushamatic

BETTER QUALITY...LOWER COSTS...AT THE PUSH OF A BUTTON



is precision balanced before installation and final grinding of register, face and bore.



Thread milling stress relieved alloy steel lead crew in a temperature-humidity



Planing of the bedway and final precision grinding of tool steel vee and flat ways are vital operations in the final accuracy of the finished lathe.



20" Model D heavy duty, 24 speed precision engine lathe.



Axelson lathe quality control, which starts in Axelson's own foundry, follows a rigid pattern throughout each step in production and assembly. Never is it more apparent than during the machining stage. Here, skilled Axelson craftsmen use the most modern machine tools to provide that extra measure of accuracy and dependability so well known to users of Axelson lathes . . . Get the facts about one of Industry's finest precision tools. Write on your letterhead for NEW, 36 page brochure No. 5400.

#### AXELSON MANUFACTURING COMPANY DIVIGION PRESSED STEEL CAR COMPANY, INC. 105 ANDRELES OR, SC. 10015 16, RCN YORK 7, TULSA 1

FITTINGS & ELECTRICAL ACCESSORIES . ORDNANCE MATERIEL . UNISHELTER RELOCATABLE HOMES . EXPORT ONLY LOC LATRES; ENGINE - TOOL ROOM - HOLLOW SPINOLE - GAP BED - PETROLEUM PUMPING EQUIPMENT.



DEEP WELL PLUMBER PUMPS . SUCHER ROOS - INTORAULIC PUMPING UNITS . AIRCRAFT COMPONENTS

KRW is the Best Hydraulic Press You Can Buy!

# Let's take one apart and prove it!



KRW Customers, which includes almost every nationally known company in the United States and Canada, tell us that KRW Presses are the best buy! They have proved it to themselves in day after day, year after year satisfactory performance. Now we want to prove to you why these customers are so right.

RAPID APPROACH OF RAM FILLS CYLINDER WITH OIL



The ram is quickly brought down to the work by rotating the "Capstan" handwheel. As the ram descends to the work the cylinder is automatically filled with oil. A flip of the ball arm closes the valve, and the first pumping stroke gives tons of pressure on the work.

WELDED
TRUSS REINFORCEMENT



The heavy steel bed and crown plates on KRW presses have a special welded truss reinforcement to give them added strength and rigidity with minimum weight. This feature minimizes deflection.

MACHINED ALL-STEEL V-BLOCKS



KRW all-steel V-blocks (furnished with the press) have machined shoulders which slide on the machined top surfaces of the bed members. This means you can slide the V-blocks along the bed to make quick setups and they're always in alignment. You get solid, rigid, accurate support. No danger of V-blocks tipping or falling between the bed members.

CONVENIENT LOCATION OF



The KRW pump handle is slightly below waist level, a natural, comfortable position which enables the operator to work for long periods of time without fatigue. He can exert whatever strength necessary easily and efficiently. It's a man-saving feature that results in better, more accurate work and greater production.

BUILT-IN MECHANICAL PRESS



Spinning the "Capstan" handwheel rotates a pinion which engages a rack cut in the ram. The sliding handles in the handwheel can be extended to increase leverage to give a ram pressure of 3 tons. This "built-in" mechanical arbor press gives the operator the advantage of the large bed and its adjustability. It permits the use of the V-blocks when necessary. If more than 3 tons pressure is required close the valve and a few pumping strokes give the needed hydraulic pressure without moving the work from the bed.

#### COMPLETE

KRW makes a complete line of one, two and three cylinder Hydraulic presses, 25 to 150 ton capacities; hand operated, air operated or motor driven. Tell us your needs. We'll send you facts, specifications and prices without obligation.



K-R-WILSON

213 Main Street, Buffalo 3, N.Y.

Designers and Builders of the Right Hydraulic Press to Solve Your Metal-working Problems!



#### with TOCCO Induction Heating

Mechanics Universal Joint Division of Borg-Warner Corporation now combines automatic heat-treating and metal-working operations on the same machine!\*

A Tocco Inductor Coil, matched to one spindle of a multiple spindle automatic screw machine, heat treats the inside diameter of automotive trunnion cups—after they have been completely formed on the same machine tool. Twenty-two, 20 and 50 kw, 450,000 cycle TOCCOtron Induction Heating units and 44 automatic screw machines (installed here and in other plants) make up this high-speed production team.

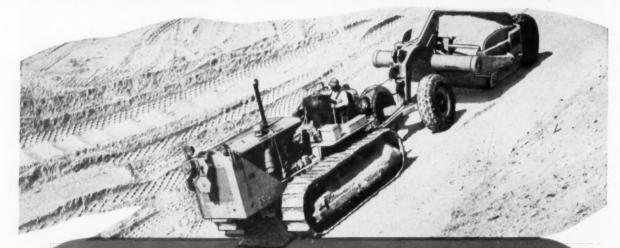
This new method permits the use of SAE 1144 steel and eliminates costly, time-consuming copper plating and carburizing operations formerly required. Heating and quenching cycles total approximately 10 seconds per part, and production is in excess of 300 parts per hour from each machine.

If your products or their components require heat treating, soldering, brazing or forging it will pay you to investigate TOCCO for better, faster ways of producing them at lower unit cost.

\*This process developed and patented by TOCCO.

# THE OHIO CRANKSHAFT COMPANY NEW FREE BULLEYIN THE OHIO CRANKSHAFT CO. Dept. M-4, Cleveland 1, Ohio Please send copy of "Typical Results of TOCCO Induction Hardening and Heat Treating." Name Position Company Address City Zone State

# For BIG TOUGH JOBS...

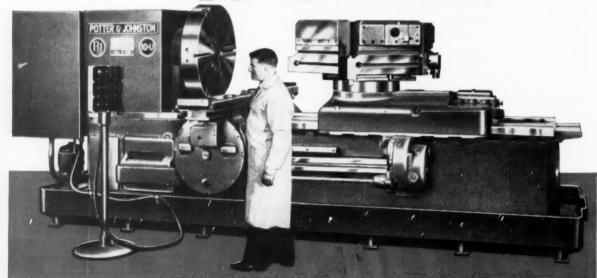


CATERPILLAR ...

AND THE

POTTER & JOHNSTON

10-U AUTOMATIC
Turret Lathe



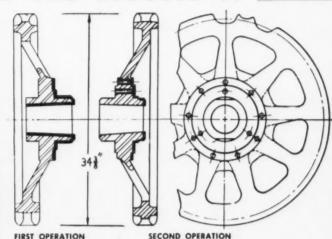
Famous as GIANT PRODUCERS that STAY ON THE JOB

# they OUTWORK all the rest

For big tough turning work that must be handled economically, it was logical that Caterpillar Tractor Co. of Peoria, Illinois looked to Potter & Johnston for the most versatile machine and method to do the job. In this case, it was to machine sprockets — 34¾" diameter cast steel track drivers with a maximum hub hardness of Shore 45.

#### HERE ARE THE RESULTS !!





HEAVY LINES INDICATE MACHINED SURFACES

#### FLOOR-TO-FLOOR TIME: 21.82 minutes per piece for complete finishing.

FIRST OPERATION: Turn taper bore with single point slide tool, turn face and chamfer inside sprocket hub.

SECOND OPERATION: Turn face and chamfer the outside hub. Drill nine .316" diameter holes equally spaced, and drill three, 23/64" diameter holes reamed to a tolerance of .001".

It takes full power, real productive capacity, and stamina to machine these track sprockets with high precision and low production costs, day-in and day-out. In this job, extra benefits from ingenious P & J Tooling were realized. As part of the second fully automatic operation, all twelve holes were drilled by using a self-driven Multiple Spindle Drill Head.

To turn out your hard-to-machine work faster and better—turn to the Potter & Johnston line of Automatic Turret Lathes—five basic machines feature fully automatic operation—from the 3-U Speed-Flex with a 9½" diameter swing over the cross slides to the Model 10-U AUTOMATIC with its 49" diameter swing over the base ways. For Model 10-U information ask for Bulletin No. 146... for information on other models, call your nearest Pratt & Whitney Branch Office. An experienced P & J Tooling Engineer will study your piece drawings and furnish an accurate written estimate of expected piece production, plus a recommendation for the best combination of tooling and operational sequence. There is no obligation for this technical service.



#### POTTER & JOHNSTON CO.

PAWTUCKET, RHODE ISLAND

SUBSIDIARY OF

#### PRATT & WHITNEY

DIVISION NILES - BEMENT - FOND COMPAN





PRICISION PRODUCTION TOOLING

WRITE BIRECT OR CONTACT THE PRATY & WHITNEY BRANCH OFFICE NEAREST YOU BRANCHAM - BOSTON - CHICAGO - CINCINNATI - CLEVELLUID - STROIT - LOS ANGELS - NEW YORK - PHILADELPHIA - PITTEBURGH - ROCKESTER - SAN FRANCISCO - ST. LOUIS - EPPORT PEPT, PAWTUCKET, E. A.



**External Grinder** 



Milling Attachment



Handlever Tailstock



Handlever Bed Turret



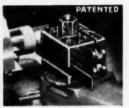
Telescopic Taper Attachment



Handwheel Collet Attachment



Handlever Collet Attachment



10 in 1 Tool Holder



**Ball Bearing Live Center** 



Adjustable Collet Bushing Chuck



Square Turret Tool Block

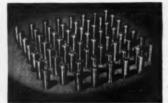


Handlever Double Tool Cross Slide



Telescoping Jaw Follower Rest and Center Rest





Steel and Brass Collets



Step Chucks and Closers



Centers and Drill Pads



Thread Dial Indicator



Micrometer Carriage Stop



Four Position Carriage Stop

#### SOUTH BEND

#### Lathe Attachments

- Cut Production Time
- Simplify Difficult Jobs
- Increase Lathe Versatility
- Speed Up Tooling
- Perform Special Classes of Work
- Reduce Operator Fatigue

Write for Catalog

#### SOUTH BEND LATH

**Building Better Tools Since 1906** SOUTH BEND 22.





Four Position Cross Slide Stop



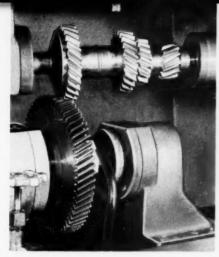
Safety and Standard Lathe Dogs



Coolant Pump



Universal Table



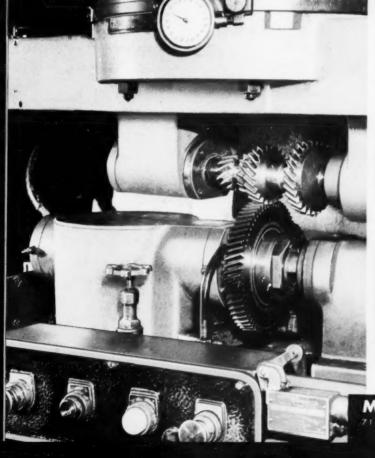
SHAVING —A large battery of Michigan model 870 rotary gear finishers (each operator handles two or three machines) shaves the gear teeth on this standard transmission cluster in a Detroit automotive plant. Pneumatically actuated adaptors speed the loading operations.

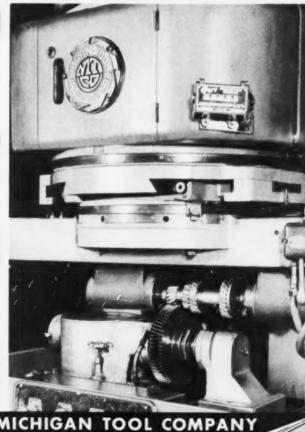
(above)—Shaving cycle time on this 27-tooth driver on the Michigan 870, using the modified underpass method, is 30 seconds.

(lower left)—This 23-tooth 3.253" diameter .765" face width intermediate gear on the cluster is finished in 24 seconds cycle time on Michigan 870 gear shavers by the modified underpass method.

(lower right)—Reverse gear on the cluster, 13-teeth, 8.25 pitch, .948" face width, is shaved by the underpass method on Michigan 870 gear finishers in 29 seconds.





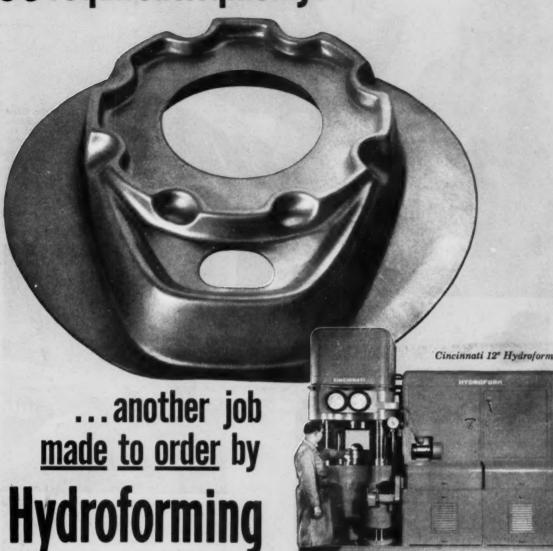


MENICHOLS RD. + DETROIT 12, MICH





## 60 required...quickly!



By producing the tail light bezel shown above on a Cincinnati 12" Hydroform, a major automobile manufacturer was able to complete development work and run off the 60 pieces required for model approval at a saving of six to eight week's timeand at an 85% reduction in tool costs!

Making conventional dies and incorporating subsequent design changes which resulted during the development of this complex part would have made tool costs excessively high. As the Hydroform tools consisted simply of a punch of steel bar stock, and a draw ring contoured to fit around the punch, original tool costs were low and modifications were readily made at minimum cost.

Additional savings resulted as Hydroforming did not impair the excellent finish of the material-.031" brass. After trimming, only light buffing was required for plating.

This is another example of the tool and time savings that Hydroforming makes possible . . . for development work . . . for short runs . . . for the production of any simple or complex deep drawn or formed part. Consult your nearest Cincinnati Milling field engineer for complete details on Hydroforming. For a description of the Hydroforming process and specifications of the 8", 12", 19", 23", 26" and 32" machine sizes, write for Bulletin M-1759-2.



Hydroform THE CINCINNATI MILLING MACHINE CO.



BD Rigid Hub-Type. Glass cloth and Nylon reinforcement. For heavier stock removal, smoothing flame-cut edges, slotting, notching, cutting-off and many other jobs where finish is less essential. Bridges the gap between the BFR wheel and the conventional cup wheel for portable grinding.

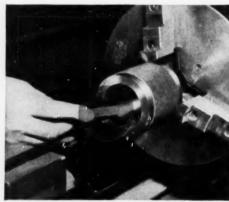




BF Semi-Flexible. A straight wheel with cotton fabric construction. Ideal for deburring jobs, including stampings too large for tumbling. Also for blending and smoothing light welds and curved surfaces, removing flash from plastics, etc. For grinding on periphery only.



BF Mounted Wheels and Points. Same laminated construction as BF wheels. Like all Norton mounted wheels and points they're trued on their own spindles. Available in a wide variety of sizes and shapes for polishing die cavities, chamfering, Brinnell spotting, etc.

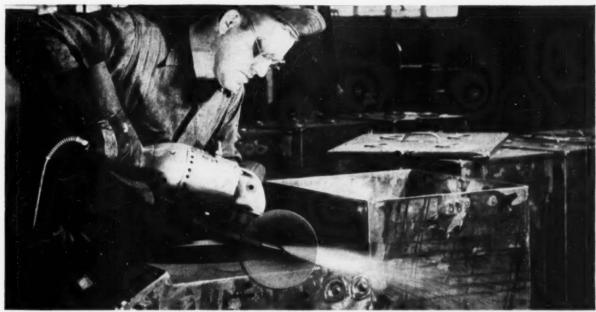


BF Hand Sticks. Laminated construction, as in BF wheels and mounted wheels and points. These convenient sticks provide an easy method of final hand polishing in places where wheels and buffing devices can't reach

## Meet the BIG4 in Reinforced Wheels BF BD BN BF

Famous Norton team features strength, versatility and safety...plus the value-adding

## "TOUCH of GOLD"



BFR Semi-Flexible Hub-Type. Cotton fabric and Nylon reinforcement. Most popular light snagging wheel Also useful for weld smoothing, blending contours, light finishing, removing scale, notching gates and risers, minor cut-off jobs, etc. Reaches hard-to-get-at places.

Here's a Norton wheel family that's closely related in a number of ways that add up to better grinding jobs for you. Each has strong, laminated construction that provides much more than the usual margin of safety. Each is designed to cover a wide range of everyday grinding jobs. And each is engineered to give you fast, trouble-free, economical grinding—the true "Touch of Gold"—every time you put it to work.

The "Big 4" make up a well-balanced team, consisting of two sturdy hub-type wheels (BD rigid and BFR semi-flexible); one straight wheel (BF semi-flexible); and one cut-off wheel (BN). All are

resinoid bonded.

The accompanying action shots can only hint at the "Big 4's" practically unlimited usefulness. Why not find out just how much time and money they can save you in your own grinding applications?

#### Ask Your Norton Distributor

to demonstrate Norton Reinforced Wheels in your shop. He knows the types and sizes of wheels you need, will be glad to help you in any grinding problems, and will call in a Norton Abrasive Engineer, if necessary. Or write to NORTON COMPANY, Worcester 6, Mass. for the Brand New Catalog on Rein-

forced Wheels. Distributors in all principal cities, listed under "Grinding Wheels" in your classified phone directory. Export: Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.



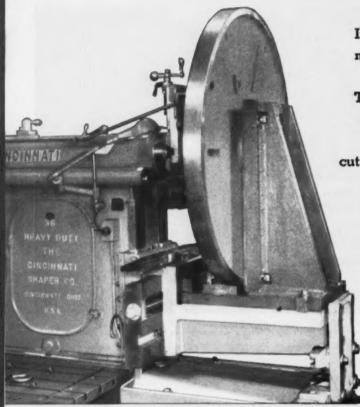
Claking better products ... to make other products better

For more information on products advertised, use Inquiry Card, page 261

MACHINERY, April, 1954-73

### INTERNAL SHAPING

## the LARGE



Internal shaping is the only practical method for many "hard to get at" jobs.

This large job is especially adaptable to this rigid Cincinnati Shaper with "drop" table. Kennedy keyways are cut to .0005" tolerance in this big gear. The low cost fixture and tool make this job profitable and simple.

Other economical internal shaping jobs include—

Internal oil grooves.

Internal contouring.

Internal teeth on special gears.

Internal guides in gate valves.

Internal slotting.

Write for New Cincinnati Shaper Catalog N-6.



THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A.

SHAPERS . SHEARS . BRAKES

# 749 .751 6.0005 6.0010 ★ The new Electro-Magnetic Clutch and Brake greatly speeds set-up and operation. TAPERED





Punch shank hole must be correctly aligned with the face of the slide. All details are important details at Minster.

Forget all your old ideas about press accuracy when you examine a Minster press. Here is a modern machine tool built to surprisingly accurate tolerances. Here is a press built with such care and precision that it has become the most wanted power press in all America.

Every wear surface, every moving part is checked for dimensional accuracy. Hand finishing is standard procedure. In fact, visitors to the Minster plant are invariably impressed with Minster's combination of fine personal craftsmanship and the use of the very latest in fine precision machine tools.

Yes, accuracy is a Minster tradition. The result, of course, is longer life, less maintenance, easier die setting, and higher production. Next time, specify Minster, a press of outstanding design, beautifully built from crown to base.



■Accurate bearing fit is a Minster characteristic. Bushings are fitted in frame and caps . . . bearings are then finished to match crank bearing surfaces . . . bore diameters are checked.

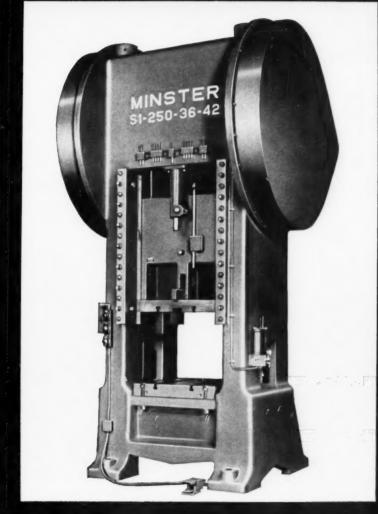


■Gib surfaces must be square with the face of the slide. At the Minster plant such inspections are routine procedure.



■Vertical travel of the slide is gaged in two directions to insure extreme accuracy throughout the entire stroke.





■ Minster S-1, single crank straight side press. One of ten press series including knuckle joints, inclinables, horning, gap, double crank, and deep throat presses.



THE MINSTER MACHINE CO.
MINSTER, OHIO



### HOWELL BRAKE MOTORS

For sudden stopping, quickly and surely—there's a Howell Brake Motor that fits your exact needs!

The Howell Brake Motor is designed for use in those applications where rapid stopping of rotation is required. Howell Brake Motors are used extensively on such machines as lathes, planers, drill presses and dumbwaiters. Quick stoppage can be accomplished on motors of all types in most sizes. Brakes are of standard construction for long life and trouble-free operation. Howell Disc Brakes are integrally mounted, simple in design, easily accessible and quickly adjusted. For complete details on using Howell Brake Motors in your operation, contact the Howell man in your area, or write the factory for Bulletin BR-1 and further information.

Three types of Howell Brake Motors



Howell General Purpose, Dripproof, Horizontal Motor (Type SC) for wall mounting, with integrally-mounted disc brake.



Howell Vertical Face-Mounted Motor with 50 ft.-lb. brake. Howell Brake Motors fit a wide variety of applications.



Howell Special Horizontal Flange-Mounted Pancake Motor with 3 ft.-lb. brake. This streamlined motor is unusually compact.



### **HOWELL MOTORS**

HOWELL ELECTRIC MOTORS COMPANY, HOWELL, MICHIGAN

PRECISION-BUILT MOTORS FOR INDUSTRY SINCE 1915

For more information on products advertised, use Inquiry Card, page 261

A PRACTICAL ANSWER

CLEARING



How would you produce the jet engine airfoil sections shown here from such a difficult-to-machine and costly metal as titanium? Utica Drop Forge & Tool Corp. does this job using closed die forging methods on a 1600 ton Clearing forging press. The complex contour of these airfoils would present an unusually tough machining problem even in soft metal. Add to that the toughness and costliness of titanium. Then you really have a job where precision forging methods demonstrate their superiority. The jet parts now come off this Clearing forging press to tolerances that eliminate all but a minimum of machining operations. Precision forging utilizes practically all of the original metal too.

If you are looking for a practical answer to a tough forging job involving power presses, a Clearing forging press consultant will be glad to discuss your problem with you in detail. Call on Clearing without obligation today.

**CLEARING PRESSES** 

THE WAY TO EFFICIENT

CLEARING MACHINE CORPORATION • 6496 West 65th Street, Chicago 38, Illinois • HAMILTON PLANT, Hamilton, Ohio







#### DETROIT BROACH TOOLS CAN OPENER WHEEL

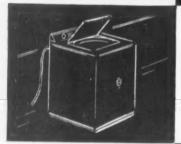
The serrations on the gripper wheel of can openers are produced with Detroit Broach tooling. While taking a big bite out of production costs, broaching produces sharp teeth with consistent form that requires no additional machining.





#### DETROIT BROACH TOOLS FLAT IRON SHOE

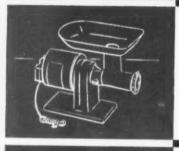
In one fast pass, Detroit Broach tooling machines the faces of these shoe castings sufficiently smooth and flat that only an additional buffing operation is required. On such castings of iron or aluminum, output is high and money is saved.





#### DETROIT BROACH TOOLS WASHER QUADRANT

Detroit Broach tooling produces twelve involute teeth in washer quadrant castings with a ½" depth of cut, accuracy of the involute is easily held within .001". In addition to accuracy, broaching is washing the spots off previous production figures.





#### DETROIT BROACH TOOLS GRINDER BLADE

Producing the internal tooth form in meat grinder blades would be a slow task by any method other than broaching. But Detroit Broach tooling produces the entire form in one pass with a surface finish so smooth that no additional finishing is required.

This is a view of the new, ultra-modern Detroit Broach plant and offices located in Rochester, Michigan—just outside Detroit. Designed by Sture Frolen, eminent Swedish architect, it embodies many important advancements that contribute to employee morale and manufacturing efficiency. Another example of the unusual facilities of Detroit Broach Company.





## Broaching Pioneers

IN THE APPLIANCE INDUSTRY



Thanks to the ingenuity of America's appliance industry, today's housewife has been elevated from the status of hand laborer to that of a skilled technician. In every phase of her daily housework, mechanical and electrical tools lighten her work and shorten her working hours.

To bring these worksavers within the reach of the average housewife has called for the application of the most economical production techniques. And that is why the appliance industry has long relied upon Detroit Broach tooling—to help them shave costs while maintaining a high level of quality. At the left are four examples.

#### in YOUR industry, too,

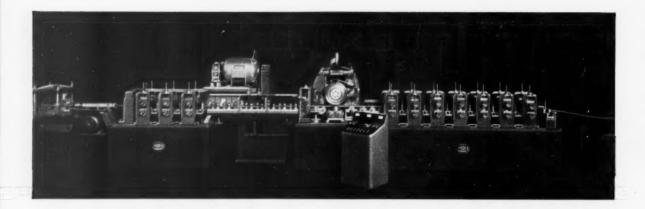
you will find countless examples of Detroit Broach tooling that is putting the squeeze on manufacturing costs. At the same time it consistently raises production output per man with automatic repetitive accuracy.

Part of the reason for the performance of Detroit Broach tooling is due to the fact that our entire efforts and facilities are keyed exclusively to this one machining technique. Another reason is our conviction that the conventional approach is not always the best approach . . . we point to some of broaching's great advancements as evidence.

Why not investigate the all-round economies that these facilities and this thinking can achieve in your plant. There is a Detroit Broach representative in your locality who can give you all the answers. Drop us a line and we'll have him call at your convenience.

Detroit Broach company

OFFICES IN PRINCIPAL CITIES THROUGHOUT THE WORLD



### Three Epoch-Making New Yoder Developments

step up scope and economy
of *Electric-weld*Tube Manufacture

- 1. For high-speed, low-cost production of tubing from aluminum, nickel, brass and other non-ferrous metals and alloys: Revolutionary new high-frequency electric induction mills for cold-forming and welding coiled strip into tubing, without drawing or heat treating. Welding speeds from 30 to 120 fpm.—almost as fast as electric-weld steel tube making. The lighter the gauge, the higher the speed and lower the cost, all the way down to .025".
- **2.** New Induction-Weld Mill for making STEEL tubing up to 4" dia. and merchant pipe up to 2" dia. Speeds up to 250 fpm.— almost double that of resistance welding.
- **3.** New 4-in-1 Resistance Welding Transformer—actually four small transformers built into the most compact, efficient, trouble-free unit ever designed for tube welding. Insures highest daily production of quality tubes, with minimum scrap loss.

All three developments are Yoder "Firsts"—making cold process tube manufacture more attractive than ever. For detailed information and literature, write, phone, or wire

THE YODER COMPANY . 5504 Walworth Ave. . Cleveland, Ohio

#### Complete Production Lines

- \* COLD-ROLL-FORMING and auxiliary machinery
- \* GANG SLITTING LINES for Coils and Sheets
- \* PIPE and TUBE MILLS-cold forming and welding

II MODELS
3 SCREEN SIZES



Pedestal Type 14" Diam. Screen



Bench Type 14" Diam. Screen 4 Models



Bench Type 5%" x 7%" Screen 3 Models

## Unsurpassed Inspection Versatility JONES & LAMSON OPTICAL COMPARATORS The Essence of Quality Control

Jones & Lamson Optical Comparators are designed and built like rugged machine tools to withstand vibration and hard use. Yet they have the built-in accuracy to satisfy the most exacting laboratory standards.

- They meet the requirements of toolroom, laboratory and production inspection.
- They precisely measure height, depth, lead or spacing, as well as angles to degrees and minutes.
   They will measure to .0001".
- They compare intricately contoured parts with a master outline and measure the amount of error.
- They are convenient to operate, easy to set up and read direct without computation.
- They operate under normal lighting conditions. No darkroom is needed.
- They will photograph the enlarged shadow and record its relationship to a master chart.
- Several persons may study the shadow at the same time.
- They will inspect and measure surface contours, as well as profiles of objects such as type faces, stamping dies, punches, worn tools, etc.



Vertical Type 14" Diam. Screen



Direct Projection Type



Pedestal Type 30" Diam. Screen



A complete line of STANDARD CHARTS
and FIXTURES is maintained by us.

JONES & LAMSON



Machine Tool Craftsmen Since 1835

COMPARATOR DIV.



Jones & Lamson Niechine Company 512 Clinton Street, Dept. 710 Springfield, Vermont, U. S. A. Please send Comparator Catalog No. 402.

COMPANY\_\_\_\_\_\_TITLE\_\_\_\_\_\_
STREET\_\_\_\_\_

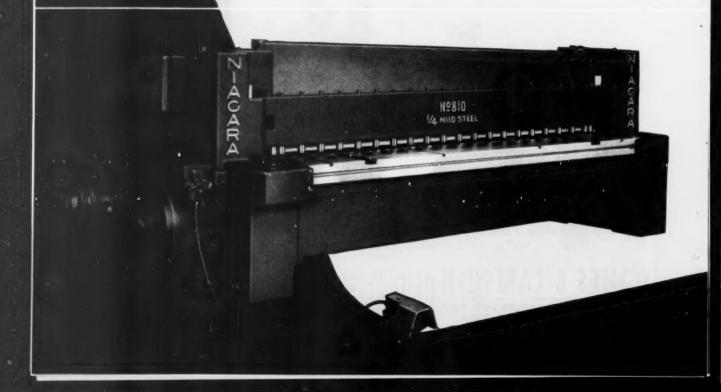
CITY

For more information on products advertised, use Inquiry Card, page 261

MACHINERY, April, 1954-83



at General Sheet Steel Co., Detroit, Mich.



after shearing thousands of tons of steel of all kinds

#### LET'S LOOK AT THE RECORD!

NIAGARA Shears are designed for HIGH VOLUME SHEARING ACCURACY DEPENDABILITY LOW MAINTENANCE COSTS

Write for Bulletin 69

#### SERVICE RECORD

Niagara Shears 1945-1952

Total Cost of Repairs

less than \$20 per shear per year

GENERAL SHEET STEEL CO.

NIAGARA MACHINE & TOOL WORKS . BUFFALO 11, N. Y.

Manufacturers of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

DISTRICT OFFICES: DETROIT . CLEVELAND . NEW YORK . PHILADELPHIA

Dealers in principal U.S. cities and major foreign countries

## HOW MAJOR INDUSTRIES NOW CUT

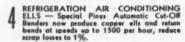
### Product Costs



PHOLLOW TRACTOR BOOMS—Cold bending 12 ga, welded steel tapered twoss without distortion on Size 4 Pines unit eliminates expensive blanking and forming dies, saves tons of material for farm equipment manufacturer.



3 EXTRUDED WINDOW FRAMES — Part of production line setup in large aluminum fabricating plant, this small Pines Semi-Automatic saves space, accurately bends automobile window frame moldings.





AIRCRAFT TUBING—Smooth, extra sharp bends now produced in ultra-thin stainless steel tubing, saves space and \$14,000 per plane for aircraft manufacturer. Shown above, Plane Size 4 Unit forming wrinkle-free 8" c/l radius bend in 4" x .020" 5, 5, tubing.

#### with PINES PRODUCTION BENDERS

The examples shown here are a few of the countless number of production jobs that are now handled efficiently and more profitably on Pines Automatic Benders. They illustrate the versatility and the many cost-cutting advantages of cold forming round, square, rectangular, extruded, or hollow stock the "Pines-Way". Simplicity of tooling, uniform accuracy, and ease of operation are proven features of Pines machines which today help hundreds of plants cut product costs. At Pines you'll find an unmatched wealth of bending experience and creative tooling skill readily available to help you develop better methods and save time on production problems.

Write for Free data sheets

To keep abreast with latest developments in bending, write for copies of "Pines News" —bi-monthly mailing piece that gives facts on new, cost-cutting bending applications.



PINES

ENGINEERING CO., INC.

5 ENGINE MANIFOLD TUBES—Short 1 1/2" c/l
O. D. steel tube now bent to 11/2" c/l
rodius with flange attached saves space,
insures accuracy, cuts costs.

BOILER TUBE AND REFRIGERATION COILS— Typical setup bending continuous serpentine coils from 3½" steel tubing. Reduces welding, fabricating costs. Other installations range from ½" copper up to 3".







## You can't inspect Quality INTO a gear

Every "Double Diamond" Gear is closely inspected for dimensional accuracy. But the basic values of "Double Diamonds" can't be "miked" because they lie beneath the surface and can be "inspected" only by lasting performance on the job.

These quality values, arising from extensive experience, engineering skill, and manufacturing care, assure the long, trouble-free gear-life for which "Double Diamonds" are very well known.

May we send further facts?





FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS GEAR-MAKERS TO LEADING MANUFACTURERS

Automotive Gear Works, inc.

ESTABLISHED IN 1914

RICHMOND, INDIANA



The New Size 00 with Centering-Size Discs

Range 1/4" to 3/8



8 Sizes cover range 1/4" to 121/8" (with extensions to 16")

Standard, Vertical and Pistol-Grip Types



#### DuBo Plug Gages



Tells more, more easily, than ordinary plug gages.

Extremely light in weight.

Single End: Sizes over 1.510" Double End: Sizes under 1.510"



#### **Dial Indicators**

Consistently accurate. Shockproof. A wide range of sizes and graduations,



## Your Choice of Many Gages

#### **Dializers**

An economical, effective means for converting AGD Adjustable Limit Snap Gages (Models A, B or C) to Dial Snap Gages. Easily installed or transferred from one frame to another.



Patented

#### Dial **Snap Gages**

Comparator (shown here with optional stand), **Encased and Decimatic** Types

Stock sizes cover range 0" to 8"

Larger sizes available



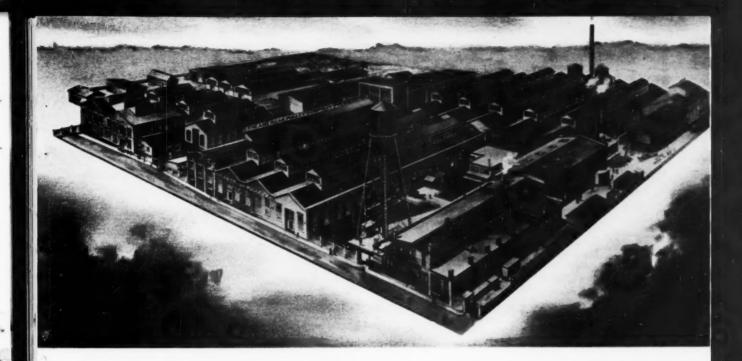
#### **Adjustable Limit Snap Gages**

AGD designs in both regular and midget models.



See These and Other Precision Gage **Improvements** at the ASTE Show **BOOTH 238** 

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.



## How the American Pulley Company's replacement program helps attain and maintain their high quality products

"The American Pulley Company, one of the leaders in the manufacture of Power Transmission Equipment and certain types of Material-Handling Equipment, has had a regular equipment replacement program for over ten years. The system by which replacements are made has changed as the scientific knowledge of when to make replacements increased, and this can be evidenced by the higher quality of our present products as compared to those of the past.

"Competition requires our products to be of the highest standards and to be made at a cost that is justifiable to the user. In order to manufacture such products Management and Engineering have instituted a long-range replacement program based on a modified MAPI method of analysis. This replacement schedule is then used as a guide in determining the yearly budget of replacements. Final selections are made by close studies of the cost savings obtainable through replacement and the cost savings necessary to justify replacement.

"Top management makes the final decisions in machine purchases, but these decisions are less difficult to make when The American Pulley Company equipment program indicates what cost-saving opportunities are available and also what it is costing the company not to take advantage of the opportunities."

JAMES H. ROBINS, President
THE AMERICAN PULLEY COMPANY

ROCKFORD INSERT GROUP Keep Gathering Metal-Working Production Ideas . . . Be Well Informed When The Time for Replacement Arrives . . . . .

## Typical Examples of "Small Lot" Turning....

### WHY THEY CAN SUNDSTRAND

These examples of time savings available from Sundstrand Automatic Lathes have been taken from the actual experience of only three of the many users of this modern equipment. All of the advantages of multiple-tool turning are available on both small lot and turning are available on both small lot and examples and compare the production figures examples and compare the production figures with parts similar to yours...then get the whole story for equivalent or better savings on turning work in your own plant.



#### Production Increased 2-1/2 Times On Lot Sizes of 100 to 500 Parts

Parts are pump rotors and covers. Previously these parts were turned on three conventional turning machines using three operators. A Sundstrand Model 8A Automatic Lathe does the same work 2½ times faster with one operator. Operations include facing, turning and core drilling. Production on cast-iron parts is 120 per hour.



### 13 Hours Saved On Each Lot of 20 Impellers

Parts are bronze, range in size from 4" to 10" in diameter. Parts were formerly machined in three operations and three set-ups in 15 hours. Same amount of machining is done in two set-ups on Sundstrand in 2 hours. Turning convex and concave shapes and boring center hole comprise operations.

#### Production Increased 70% On 12 Different Jobs

Here are "before" and "after" illustrations of three of 12 different turning jobs on a Model 12A Automatic Lathe. Operations include turning, facing and chamfering. Production increases average from 65% to 70%.



AUTOMATIC LATHES , SIMPLEX RIGIDMILS , DUPLEX RIGIDMILS

SUNDSTRAND

"Engineered Production" Service\*









Machinery, April, 1954

MACHINES DESIGNED TO MEET YOUR HEEDS ROCKFORD, ILLINOIS, U.S.A.

## BE HANDLED PROFITABLY ON AUTOMATIC LATHES

Seven machine design features govern the possibility of turning short-run work on Automatic Lathes otherwise limited to mass production turning only. They include (1) Wide range of carriage cycles, (2) Adequate feeds and speeds, (3) Quick cycle change, (4) Simplicity



Note convenient location of speed and feed change gears for quick change over.

of adjustment, (5) Adequate power, (6) Automatic cycling and (7) High rapid traverse rate. Sundstrand Automatic Lathes have all seven. One of the most important of these is:

#### Wide Range of Tool Action

Straight feed-in type carriage with slow up and dwell and tool relief provides wide range of action for front tools. Many cycle combinations are possible by merely making simple adjustments.

### Universal Tooling Handles Wide Range Of Parts

Illustrated at right are Sundstrand universal tool blocks which are quickly and easily positioned for many different jobs. Setting tools to master samples is one method of reduc-



ing set-up time. There are many others. Sundstrand engineers are available to assist you in analyzing and making suggestions for the most profitable tooling for your turning production. Call on them without obligation.

#### TRIPLEX RIGIDMILS

SPECIAL MACHINES



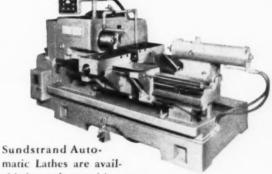


#### Quick Cycle Change for Faster Set-Ups

Complete control of all cycles is provided by adjustment of dogs on a disc as shown in illustration at right. Making cams is elim-



inated. Changing position of dogs on disc changes length of rapid approach, feed and rapid return stroke—enables operator to set up cycle quickly and change over from one job to another easily.



able in work capacities ranging from 5 to 75 HP and in varying speed combinations and lengths. Shown above is a Model 12A Automatic Lathe with 50 HP spindle drive motor.

## TA TO THE PARTY OF THE PARTY OF

#### Free Data

Complete information on Sundstrand Automatic Lathes can be obtained from these booklets. Ask for bulletin 642

#### SUNDSTRAND Machine Tool Co.

2530 Eleventh St. . Rockford, III., U.S.A.



#### PRECISION PRODUCTION

with ROCKFORD ECONOMY LATHES



MEDIUM-SIZED

ECONOMY - PRICED

Big Accurate Lead Screw
Independent Feed Shaft
Precision Timken Bearing Spindle
Heavy Tail Stock, Anti-Friction Thrust Bearings
Hobbed and Shaved Headstock Gears
Tool Room Accuracy, Zero Precision Bearings
All-Geared Head, Quad-V-Belt Drive
Heavy Cuts, 16" or 18" Swing, 30" Center Distance
6' Bed, Double Wall Apron, 3100 lbs. Total Weight

With these features Rockford Lathes offer you either Tool Room or High Production operation, with modern design, ample dimensions and high quality materials.

Ask a Rockford Machine Tool Representative to give you full details on the practical production advantages of these heavy service, medium sized, economy priced machines.

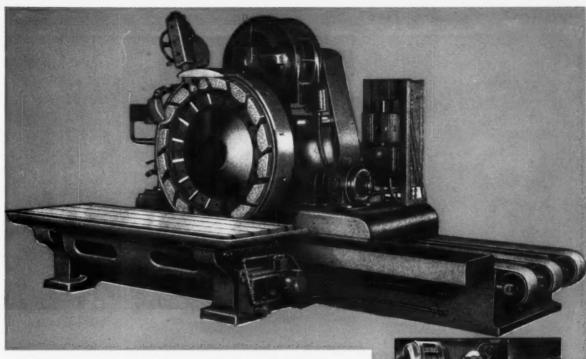
ROCKFORD ECONOMY LATHES-16" and 18"

ROCKFORD MACHINE TOOL CO.
2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS



Machinery, April, 1954

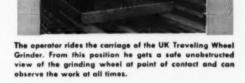
CENTER OF MACHINE-TOOL EXCELLENCE ROCKFORD, ILLINOIS, U.S.A.

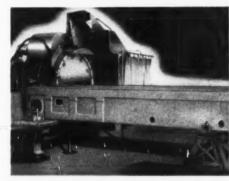


## MATTISON TRAVELING WHEEL GRINDER FOR FAST FINISHING OF LONG OR LARGE PARTS

If your work consists of long or bulky parts, Mattison UK Traveling Wheel Grinders will finish them at a surprising rate of speed and accuracy and at very low cost. Large and awkward shaped pieces are frequently ground in a good deal less time than previous method. The part, no matter how large, is clamped in a stationary position and the grinding wheel passes across the surface to be finished. Amount of floor space needed is little more than half that required by traveling table machines of equal capacity. The operator's position on the carriage, together with the convenient grouping of all controls, makes for utmost grinding accuracy and speed regardless of the size of the job.

For further information, send for new free circular No. 844-2 RM covering this machine.





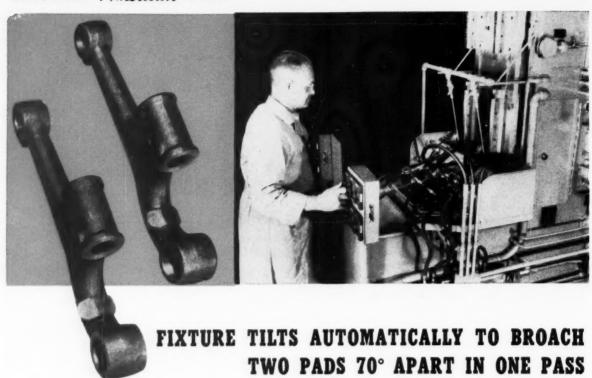
Heavy work of practically any length can be rapidly ground to close tolerances with no more power required than for lighter work — the UK's table is always stationary. Picture shows end of 35° base being ground.



MACHINE WORKS

ROCKFORD - ILLINOIS





standard American machine and broaches, special American fixture solve problem

Two angle pads located 70° apart on a steel steering knuckle support are broached in one pass on a standard American vertical single ram surface broaching machine. A two station fixture on a receding work table is provided to allow for automatic tilting. Two broaches are mounted in vertical line for each station with a gap of about 12" between them. This gap allows clearance for the part to be tilted into position for broaching the second pad.

The operator loads two parts. The parts are then automatically clamped and the receding table moves into broaching position. The first pad is broached — then between the gap, the fixture automatically indexes tilting the part so that the second pad can be broached. The table automati-

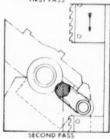
cally moves back, parts tilt up and automatically unclamp, and the operator is ready to begin the cycle again.

American engineers are equally adept at designing machines, broaches and fixtures to solve your metal removal problems. Send a part print or a sample with your hourly requirements for a suggested solution. There is no obligation on your part.

American Circular 300 which lists all the standard American Vertical Hydraulic Surface Broaching Machines is yours for the asking. Write for it today.









mericane Broach & MACHINE CO

DIVISION OF SUNDSTRAND MACHINE TOOL CO.

American Building - Ann Arbor, Michigan

See American First — for the Best in Broaching Tools, Broaching Machines, Special Machinery





## automatics

#### INTERCHANGEABLE CROSS-SLIDE CAMS

On Greenlee Automatics. cross-slide cams are fully interchangeable - any cam can be used to move any cross-slide. Drive for the cams is arranged in such a way that the cross-slide travel is in a selected ratio to the travel of the main slide. Standard cams are available to provide a wide range of ratios.

In the average job shop, a set of only 15 standard cams will provide enough flexibility to take care of 90% of the jobs that will come through. Standard ratios range from 11/2:1 to 8:1.

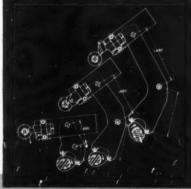


The distinctive Greenlee cross-slide cam design and operating features promote production efficiency on many short-run jobs because they reduce changeover time. In addition, there is an economy of investment.

As shown at the left, cross-slide cams are located at the sides of the machine, under the open ends of the cross-slide housings, where they are easily accessible.

As shown at the right, each cross-slide is operated independently by a separate cam, making it easier to split up operations and arrange better







Write for FREE Literature

GREENLEE BROS. & CO. 1864 MASON AVE., ROCKFORD, ILL.





## 10 solutions

TO DIVERSE PRODUCTION PROBLEMS WITH

W.F. & JOHN BARNES SPECIAL MACHINES AND EQUIPMENT

The 10 examples shown here are typical of the broad range of special machinery and allied equipment that are today designed and built at W. F. & John Barnes. All have been especially engineered to meet a specific production problem. Each represents a profitable solution to the problem of saving time and cutting costs. Collectively, these machines present tangible evidence of the coordinated skills and versatility of machine building experience available to you at Barnes.



TWO-WAY HORIZONTAL BORING
MACHINE — rough bores and chamfers automobile transmission cases at
82.5 pieces per hour (80%). This unit completes 18 operations.



BARNES SPECIAL MACHINE—
drills and counter-sinks Tractor Spindle Extensions. Performs ten operations
with pieces completed at the rate of
19.5 per hour (80%). Center head has 4spindle cluster arranged for pivoting to
provide adjustable spindle pattern.



SPECIAL SEMI-AUTOMATIC TESTING MACHINE — developed to test for leaks in automotive power steering castings. Four castings are inspected with each machine cycle. Workpieces are loaded and unloaded manually . . . all other operations are performed automatically.

AUTOMATIC RETORT
LOADING MACHINE
— one of a variety of
special equipment, such as
glass handling machines,
can unloaders, carton uncasers, and special conveyors, designed and built
by Barnes for the food,
chemical, and beverage
industries.







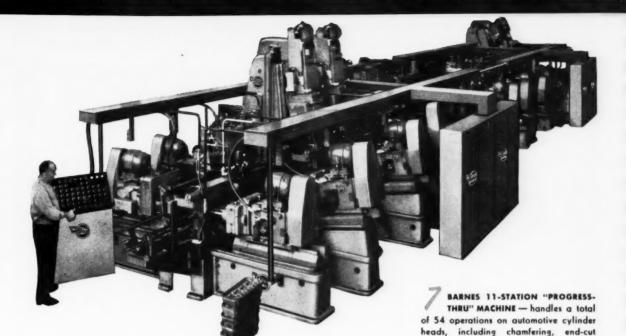
BARNES 6-STATION CENTER COLUMN MACHINE — with 72" diameter indexing table, completes 18 operations per piece, 118 pieces per hour, on Cast Aluminum Transmission Extension Housings in a large automotive plant.



SPECIAL VERTICAL SINGLE-SPINDLE MILLING MACHINE — with 72" saddle, slab and face mills mounting pads on a variety of motor frames. Quick setup features enable 61/2 pieces to be completed per hour.

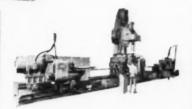
BUILDERS OF BETTER MACHINES SINCE 1879
MULTIPLE SPINDLE DRILLING - BORING - TAPPING







automatically controls regeneration and service operations on two sets of deionizing tanks, alternating units for a constant supply of treated water... one of countless applications where Barnes Electrical Controls add efficiency and economy to everyday industrial operations.



SPECIAL TWO-WAY VERTICAL AND HORIZONTAL BORING MACHINE—rough, semi-finish, and finish-bores, chamfers, and faces Final Drive Housings. Spindles automatically change speeds and feeds to meet boring and facing requirements.



reaming, and counterboring operations.
All operations are performed in a con-

APRON-TYPE CONVEYOR — especially designed for efficient removal of chips from machines used in a large automotive plant. Barnes Conveyors have been designed and built for a wide variety of applications.

### BARNES SPECIAL MACHINE TOOL BUILDING SERVICE INCLUDES...

SPECIALIZED MANUFACTURING FACILITIES — 75year background, large well equipped plant efficiently tooled to produce high production machines.

SPECIAL HYDRAULIC EQUIPMENT—designed and built to meet JIC standards. Individually engineered units assure smooth, dependable actuation for every requirement.

SPECIAL ELECTRICAL EQUIPMENT and CONTROLS individually designed and built for maximum safety and ease of control with circuits that assure the most dependable coordination of all machine functions. SPECIAL GAUGES, FIXTURES, TOOLS — designed for each individual machining problem, assure accuracy of operations at high production speeds.

SPECIAL HANDLING AND CONVEYOR EQUIPMENT—
designed and built to reduce work handling, effect
maximum safety and efficiency.

COORDINATED DESIGN AND ENGINEERING — Mechanical, Hydraulic, Electrical, Process, Tool, and Fixture Engineers work together at Barnes. Teamwork solves complex problems quickly.



Write FOR FREE DATA

"Coordinated Machine Engineering"

— a free booklet describing modern
machines and mass production technique. Write for your free copy today.

W. F. & JOHN BARNES COMPANY . 310 SOUTH WATER ST., ROCKFORD, ILLINOIS

MACHINES . AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES













### INGERSOLL BORING TOOLS SPEED DIESEL CRANKCASE PRODUCTION

These unusual Ingersoll inserted blade boring heads are used on a specially designed Ingersoll machine built for a manufacturer of diesel locomotives.

The range of our experience in machining holes is further illustrated by tools which Ingersoll has developed for high-production work on automobile cylinder blocks and for small-lot production on all types of general-purpose bar-type machines.

Have you investigated opportunities for savings in your work through the use of multiple-point Ingersoll boring tools in place of single-point tools?









WRITE FOR Catalog 608, describing ingersoll Inserted Blade face mills, end mills, helical slab mills, side mills, arbor cutters, angular cutters, and boring heads.

"INGERSOLL

BUILDERS OF SPECIAL DESIGN MILLING & BORING MACHINES  $\frac{SHLRR}{CLERR}/\text{Cutters}$ 

MILLING MACHINE COMPANY

ROCKFORD, ILLINOIS, U.S.A.





230 per hour

## bore-to-bore sizing

SIZE, FINISH, STRAIGHTNESS, ROUNDNESS

**Automatically Controlled Through** 

BARNESDRIL PLUGMATIC SIZING

Get a copy of the New Complete Honing Service Bulletin, Write for Bulletin B5005



This new BRENESDRIL

Honing Tool compensates
for blind-end bore conditions and controls stock removal
at high production rates to produce
uniformity from bore-to-bore.

Used on a BARNESDATE No. 223
2-Spindle Hydraulic Honing Machine, this tool removes .002" stock from a 1.219" diameter blind bore having 1/4" relief at the bottom. 230 sleeves gross are finished per hour within .0002" bore-to-bore and 25 RMS finish.

Blind-end bores are difficult to control for uniformity and this BARNESDRIL method establishes a production basis for greatly reducing cost per piece. When you have bore finishing and sizing problems, or any other type of production honing requirements, call a BARNESDRIL engineer to assist you in obtaining highest quality of bore at minimum production cost.

BARNES DRILL CO.

820 CHESTNUT STREET . ROCKFORD, ILLINOIS

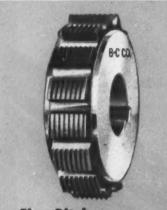


### THERE'S A Barber-Colman HOB

Choose from unground, ground, ultra-precision, carbide-tipped, multithread, roughing, pre-finishing or finishing hobs — made with standard or special tooth form, straight or taper bore — in a complete range of sizes and pitches. You'll find one that's designed particularly to produce your special requirements.

Because of more than forty years of gear cutting experience, Barber-Colman engineers can recommend tools which will best fit your requirements. They can supply gear hobs in any of the standard classes of tolerances, plus an ultra-precision class. These hobs range all the way from small 268 DP hobs to those for the largest hobbing machines as coarse as 1 DP. With improved methods and equipment used in their manufacture, these hobs produce gear tolerances exceptional within their respective classes.

If your plant is cutting gears, you will find this Barber-Colman service the easiest, most direct and efficient approach to control of your gear quality problems. Write today for recommendations on your jobs.



To 268 DP Unground

To 208 DP Unground To 200 DP Ground

To 200 DP Ground
Barber-Colman fine pitch hobs
were introduced for production
use in 1936. Today, they are the
finest hobs made in the extremely
fine pitch class for instrument, fuse,
moter and watch gears.



Large diameter, coarse pitch gear hobs for your marine and power requirements are manufactured on special forming and grinding equipment, reserved especially for that purpose.

DESIGNERS OF STANDARD AND SPECIAL



### FOR EVERY ONE OF YOUR GEAR REQUIREMENTS

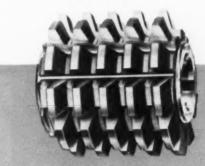
CLASS AA ULTRA-PRECISION HOBS Barber-Colman engineers are now able to announce another development in gear accuracy. For a number of years we have been making a precision ground hob known as Class AA, to meet the tooth profile tolerances demanded for extreme quietness, smoothness and constant rate of rotation. These hobs are recommended where machine and tooling conditions are consistent with the use of such a fine tool.

Take a close look at your gear requirements and see whether you are taking full advantage of all the refinements available with Barber-Colman gear hobs and gear hobbing machines. Ask one of our field engineers to call and discuss your gear problems, or send blueprints showing the tolerances required. There's a hob in this complete line to take care of your requirements.



#### Multithreads

Barber-Colman Multithreads are designed especially for high production requirements, and can be furnished with either ground or unground form.



#### Ground Classes

Class A Precision Ground
Class B Commercial Ground

#### **Unground Classes**

Class C Accurate Unground

HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES



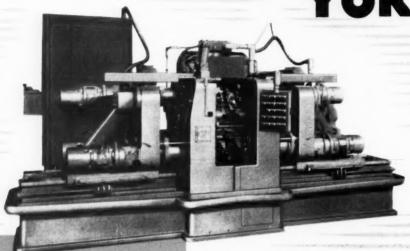
### Barber-Colman Company

GENERAL OFFICES AND PLANT, 7.4 ROCK STREET, ROCKFORD, ILLINOIS, U.S.A.



## Rehnberg-Jacobson

SPECIAL MACHINE DRILLS, COUNTERSINKS, AND TAPS
SEVERAL DIFFERENT UNIVERSAL JOINT
YOKES



DOWN TIME FOR ADJUSTMENT AND TOOL REPLACEMENT IS REDUCED TO A MINIMUM

This 4-station, trunnion-type, automatic index machine has a number of features specially incorporated to enable it to meet some rather high production requirements. On each side, three R-J Self-Contained Units (two Drill and one Tap, each with two-spindle heads) are supported in a hydraulically-operated saddle or slide which has a rapid return and approach to permit a quick

index. The extra travel provided by the saddle brings the tools clear of the central housing, so they can be changed easily when necessary. Also, it permits the two-spindle heads to be rotated to different positions, as required by certain of the pieces processed on this machine. The trunnion-type Index Unit has four hand-clamped work holding positions, each with interchangeable fixtures. For similar ingenious solutions of production problems — consult your Rehnberg-Jacobson representative.

REHNBERG-JACOBSON MFG. COMPANY

DESIGNERS & BUILDERS OF SPECIAL MACHINERY

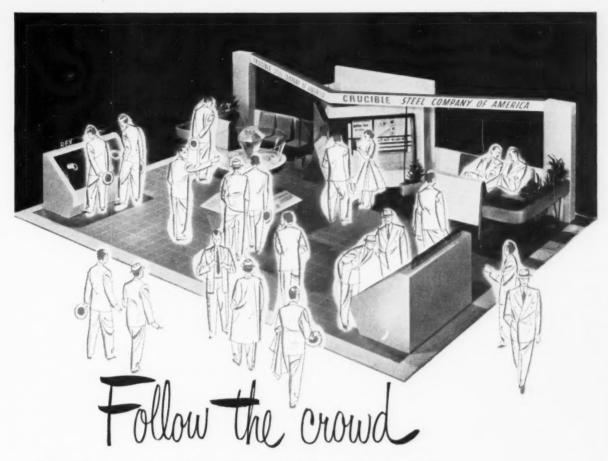


2135 KISHWAUKEE ST. ROCKFORD, ILLINOIS

Machinery, April, 1954



NACHINES DESIGNED TO MEET YOUR NEEDS ROCKFORD, ILLINOIS, U.S.A.



#### TO THE BIG CRUCIBLE EXHIBIT AT

#### THE ASTE SHOW...

#### **BOOTH 626**

American Society of Tool Engineers Show Convention Center, Philadelphia, Pa. April 26-30 There are always worth-while things to see at the Crucible exhibit...and there'll be even more in the way of helpful material this year. Among other items, you'll find new exhibits and information on Rex high speed steels, tool steels—including hollow tool steel bars—and other special purpose steels.

You'll find, too, a group of experienced Sales Engineers and technical people who can help you with your application problems. So be sure and follow the crowd to the Crucible booth. We'll look for you.



CRUCIBLE

first name in special purpose steels

54 years of Fine steelmaking

TOOL STEELS

CRUCIBLE STEEL COMPANY OF AMERICA . TOOL STEEL SALES . SYRACUSE, N. Y.

For more information on products advertised, use Inquiry Card, page 261

MACHINERY, April, 1954-103

### **CUMBERLAND GROUND BARS**

We manufacture 8" diameter, 7-1/2", 7", 6-1/2", 6", and also odd and intermediate sizes down to and including 1-1/8".



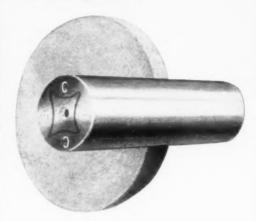
ON THE WEST VIRGINIA SHORE, OVERLOOKING THE POTOMAC RIVER, STANDS THE JAMES RUMSEY MONUMENT

The first practical steamboat in the world was run on the Potomac River a few miles below Cumberland, Maryland.

GEORGE WASHINGTON said in his diary, under date of September 6, 1784: "Remained at Bath all day and was shown the Model of a boat constructed by the ingenious Mr. Rumsey, for ascending rapid currents by mechanism; the principles of this were not only shown, and fully explained to me, but to my very great satisfaction, exhibited in practice in private under the injunction of secretary." of secrecy-

At a later date George Washington said in his diary: "Spent the afternoon with Mr. Rumsey and then Alexander Hamilton and I rode on to Cumberland, Maryland.

#### CUMBERLAND STEEL COMPANY



#### **Symbol of Quality**

Approximately 100 years after the exhibit of this steamboat, Cumberland began grinding bars. They found through experience this was the best method by which accurate steel bars could be produced. These bars are so carefully ground that they are adapted for mass production where gears, pulleys, sprockets and bearings must slide on the bars without delay due to filing or fitting.

#### IMMEDIATE BARS

DISTRIBUTED BY

Baltimore, Maryland—Addison Clarke & Bro.
Boston, Mass.—Hawkridge Brothers Company
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Buffalo, N. Y.—Jos. T. Ryerson & Son, Inc.
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Milwaskee, Wis.—Central Steel & Wire Co.
Montreal, Canada—Drummond McCall & Co., Ltd.
New Orleans, La.—R. J. Tricor, Co.
New York City, N. Y.—Might Steel Corp.
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Portland, Maine—W. L. Blake & Company
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Providence, R. I.—Congdon & Carpe

CUMBERLAND, MARYLAND, U. S. A. INCORPORATED 1892

# Tool Steel Topics



BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

### BETHLEHEM TOOL STEEL ENGINEER SAYS:

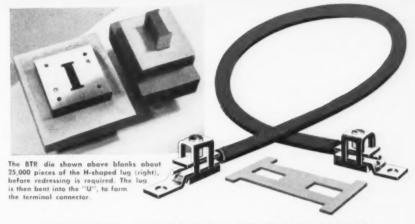
Be Sure to Heat Tools Uniformly

It has always been widely recommended that tools be heated uniformly to the hardening temperature. Unfortunately, this practice is seldom followed.

Absolute uniformity is impossible, as the outer surfaces of a tool must be heated before the interior. The uniformity of heating which results when a tool of constant cross-section is heated, by first preheating and then transferring to a furnace operating at the hardening temperature, is generally satisfactory,

However, when a tool of varying section is encountered (for example I in, at one end, and 3 in, at the other end), uniformity of heating cannot be attained by heating in open furnaces. What's the answer? Simply pack the tool in east-iron chips in a container. Heating through the chips occurs so slowly that the tool can be heated uniformly regardless of section

This procedure can be followed with most types of tool steels - with one exception. With high-speed steels, castiron chips cannot be used because the east iron melts at the temperatures used in heat-treating high-speed steels.



### BTR DIE BLANKS 25,000 LUGS FROM STRIP STEEL BETWEEN GRINDS

One of the parts produced by Pelham Electric Manufacturing Corp., Eric, Pa., is a solderless U-shaped lug, for use on panelboards and switchboards. The lug is blanked from hot-rolled strip steel, 1's in. thick. Engineers at the Pelham plant selected BTR for the die, and they've had every reason to be pleased with its performance.

The die, operating in a 25 ton press, has a Rockwell C hardness of 60-62. It's economical, because it produces 25,000

pieces between grinds, with only .008 in. to .010 in, removed in redressing, And it is standing up well on both countsgood wear-resistance and good shockresistance.

BTR is our general-purpose oilhardening tool steel of the manganesechromium-tungsten-vanadium type. In addition to being resistant to wear and shock, BTR has a good reputation for low distortion, and for ease of machining

BTR - TYPICAL ANALYSIS 0.90 Chromium 0.50 Carbon Manganese 1.20 Vanadium 0.20 Tungsten 0.50

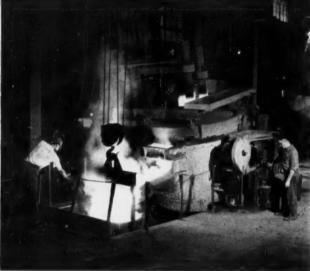
BTR combines abrasion-resistance and toughness, making it suitable for a wide variety of tool-and die applications.



This huge multiple punch-and die set blanks 90-mm shell dises, 87/8 in. in diameter, from .690 gage, C-1030 plate steel. The punches and dies are made of A-H5 tool steel, hardened to Rockwell C 50 to 55. They turn out about 4,500 pieces in an 8-hour turn, and require but a minimum of redressing. A-H5, our 5 pet chrome, air-hardening steel, is well known for durability, minimum distortion in heat-treatment and easy machining.

# These are the working with the to make your





At Lebanon there are electric furnaces capable of melting up to 8500 pounds—induction furnaces with 2000-pound maximum capacities. Here, too, special Swiss\* molding and production processes are combined with the finest in American methods and procedures. The CENTRI-DIE\* process for making centrifugal castings in permanent molds—a process

introduced in this country by Lebanon—provides the highest quality castings for difficult corrosion and heat resisting services. Pattern-making, coremaking, heat-treating, finishing and cleaning complete the picture of equipment that produces Lebanon CIRCLE © eastings.

But equipment is not the whole story. Lebanon



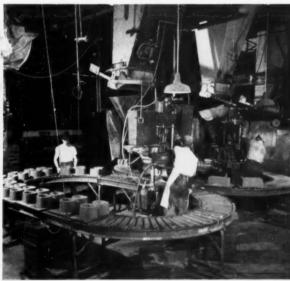
CARBON, SPECIAL ALLOY AND STAINLESS STEEL CASTINGS

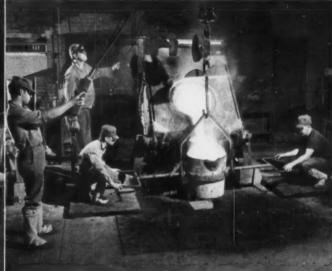
STEEL FOUNDRY LEBANON PENNSYLVANIA

### <u>right</u> men <u>right</u> equipment



## STEEL CASTINGS





foundrymen add immeasurably to the high quality of CIRCLE © engineered products. These workers are craftsmen in every sense of the word, men trained and highly skilled, men dedicated to doing all they can to make your castings right.

If the pictures on these pages could talk they'd say, "Here's where equipment and craftsmen make

Lebanon CRCLE © eastings to a high standard—not to a price!" We believe sincerely that there is no economy in buying just by price . . . it is far better to buy the best product at a reasonable cost.

LEBANON STEEL FOUNDRY . LEBANON, PA.

\*Special processes acquired from George Fischer, Ltd., of Switzerland, Lebanon Steel Foundry was also the original licensee for the centrifugal casting process developed by Firth-Vickers Stainless Steels, Ltd., Sheffield, England,

Lebanon Steel Foundry 60 Lehman St., Lebanon, Pa.

Please send me one of your new Lebanon Slide Charts.

Name

Company

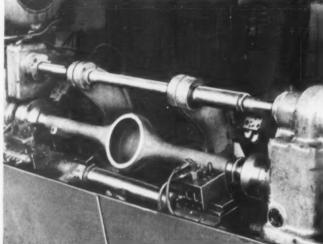
Address

Get your Lebanon Slide Chart now...

This handy slide chart gives you the nominal analyses, various designations, minimum mechanical properties and heat treatment for 19 Lebanon carbon and low alloy grades and 17 stainless and corrosion-resistant grades. Send coupon today . . .



### Hard at Red Heat, and Tough, Too!



### INTERMITTENT CUTTING AT RED HEAT . . .

Machining time on these shafts was cut in half using HAYNES STELLITE tools. The eccentric shafts (SAE 4340) steel) are machined dry, and the tool and chips glow cherry red. The off-center cut, plus the length of the shaft, sets up unavoidable chatter. Harder tools were not tough enough to handle the cut, nor were tougher steel tools effective at red heat, HAYNES STELLITE tools had the combined red bardness and toughness to do the job right.

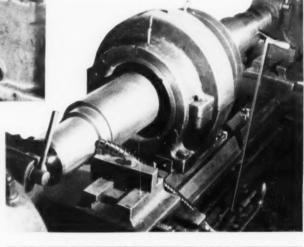
### A COST-CUTTING COMBINATION . . . .

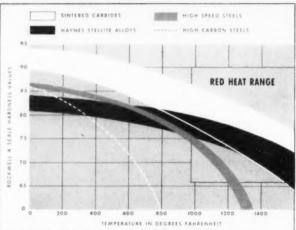
This graph shows the hardness properties of HAYNES STELLITE tools, Their high hardness at red heat, combined with their inherent toughness, accounts in part for the fine performance and savings gained through their use.

If your aim is to increase production and cut costs, write today for a copy of "HAYNES STELLITE Metal-Cutting Tools," This manual of tool practice is published as a service to you.

### IMPACT RESISTANCE PLUS ...

HAYNES STELLITE tools are tough! They machine 50 of these axle housings per hour, averaging 150 pieces between grinds. Tool wear and chipping are kept at a minimum despite deep cuts and severe workpiece vibration. HAYNES STELLITE tools handle the cuts at high feed rates, while operating at





### HAYNES STELLITE

Metal Cutting Tools

The original cobalt-chromium-tungsten metal-cutting tool. "Maynes Stellite" is a registered trade-mark of Union Carbide and Carbon Corporation

### Haynes Stellite Company

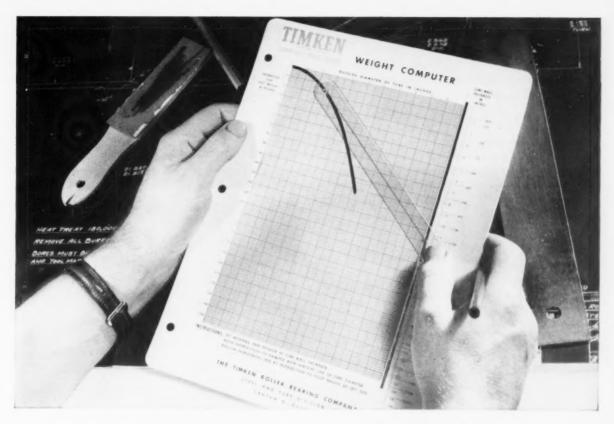
A Division of

Union Carbide and Carbon Corporation

General Offices and Works, Kokomo, Indiana Sales Offices

Chicago — Cleveland — Detroit — Houston

Los Angeles-New York-San Francisco-Tulsa



# This free computer quickly figures the weight of steel tubing

WITH this handy little computer, you can quickly figure the weight of steel tubing. You set the slide at tube-wall thickness and O.D. and simply read off the tube weight per foot. Write us and we'll send you one. There's no obligation, of course.

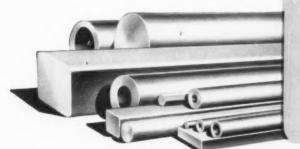
This computer is a small example of the helpful service the Timken Company offers manufacturers of hollow steel parts. Even more important: our engineers will be glad to study your problem and recommend the most economical tube size, *guaranteed* to clean up to your dimensions.

Many companies that formerly used bar stock for

their hollow parts are making significant savings because they switched to Timken® seamless tubing. In addition to the big reduction in scrap loss, they save a great deal of machining time. Frequently, finish boring is the first production step. Machine tools are released for other jobs.

Timken seamless tubing has fine forged quality because it is made by a piercing process which is basically a forging operation. Write us now on your company letterhead for the handy tube weight computer. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD - THROUGH EXPERIENCE AND RESEARCH



TIMKEN

TIME Alloy

STEEL



SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

For more information on products advertised, use Inquiry Card, page 261

MACHINERY, April, 1954-109

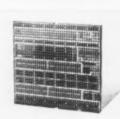
### Make Sure You're Not Missing These Tooling Advantages!

Make this 3-Minute Check . . . Discover how a modern die steel can give you diemaking and production advantages no other steel offers you!

Are you aware of how tool and die steels have been improved in the last 5 to 10 years? New steels are now available that handle easier, run longer between grinds, bring down diemaking costs. Here are facts about

Vega (Air-Tough) Die Steel—just one steel in Carpenter's Matched Set of 12 modern die steels. Compare Vega and what it offers, with the die steel you're using. Check it point by point. You'll see what a difference a Carpenter Matched Tool and Die Steel can mean to your production and profits. THE CARPENTER STEEL CO., 105 W. Bern St., Reading, Pa.

### Here is what Vega gives you . . . COMPARE it with the die steel you use . . .



Freedom from Size Change in Hardening. The mold for this  $9\frac{1}{2}$ " x  $10\frac{1}{2}$ " plastic control panel has  $1,280\frac{1}{22}$ " dia. holes, six  $\frac{3}{8}$ " dia. horizontal ports for heating and cooling, plus eight  $\frac{3}{24}$ " dia. tapered holes on the edge. Vega was the only steel of many tried that could successfully hold the close tolerances of .0002" on centers of the 1,280 holes! Will the steel you use behave in hardening like this?



Fosy, Low Temperature Heat Treating. You heat treat Vega from a temperature of only 1550°F (actually 200°F lower than the 5% chromium air-hardening grades!). No need for special, high temperature furnaces! Are you getting the benefits of low temperature heat treating from the air-hardening steel you use?



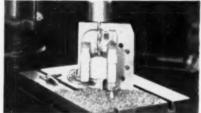
Extra Economy in Hardening. Because of Vega's lower hardening temperature, troublesome pack hardening to avoid excessive scaling is usually unnecessary. Does the air-hardening steel you use give you this extra economy in hardening?



Uniform Deep Hardenability. Vega gives you the advantages of uniform, deep hardenability in very heavy sections. For example, Vega hardens to Rockwell C-60 from surface to center in sections as large as 8'' round. How does the steel you use compare on this score?



Toughness with Good Hurdness. This punch and die blanks  $\frac{1}{4}$ " diamond threshold plates at one stroke. With previous air-hardening die steel, tools chipped and broke before any real production was made. With Vega these tools are in regular production—and there are no signs of wear or chipping to date. Will the steel you use perform in service like this?



Good Machinability. Unlike ordinary air-hardening grades, Vega has a well balanced analysis with a small percentage of hard-to-machine alloys. Field tests prove it to be one of the easiest of all air-hardening grades to machine. If the air-hardening grade you use fails to provide this good machinability, you're missing out on lower costs.

# change to Carpenter

Matched Tool and Die Steels



... modern die steels engineered to meet today's requirements!

Export Department: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"
Get Immediate Delivery... Call your Carpenter Mill-Branch Warehouse, Office or Distributor.

WHAT IS YOUR

TOUGHEST

METAL CLEANING JOB?

HAVE YOU

TRIED THE NEW

OAKITE MATERIAL

FOR IT?

### Oakite has new materials for many tough jobs

- 1. Heavy-duty cleaning in tanks
- 2. Cleaning sensitive metals
- 3. Etch-cleaning aluminum
- 4. Washing in pressure-spray machines
- 5. Electrocleaning zinc-base die castings
- 6. Cleaning magnesium alloys
- 7. Putting heavy phosphate coatings on steel in preparation for painting
- 8. Pickling and conditioning for painting in one operation
- Cleaning, pickling and conditioning for painting in one operation
- 10. Stripping paint
- 11. "Killing" paint in spray booth wash water
- 12. Drawing and forming

During the past year, the Oakite Chemical Research Laboratory has produced 16 new or improved materials for performing 12 difficult metal-cleaning jobs and related operations.

One of these new materials may be the perfect answer for some metal-cleaning problem that's been giving you a lot of trouble. Just check the list of cleaning jobs, then circle the corresponding number in the coupon, and we'll be glad to tell you about the new chemical designed for your work.

FREE Our 44-page illustrated booklet "Some good things to know about Metal Cleaning" has been revised to discuss the applications of the 16 new materials.

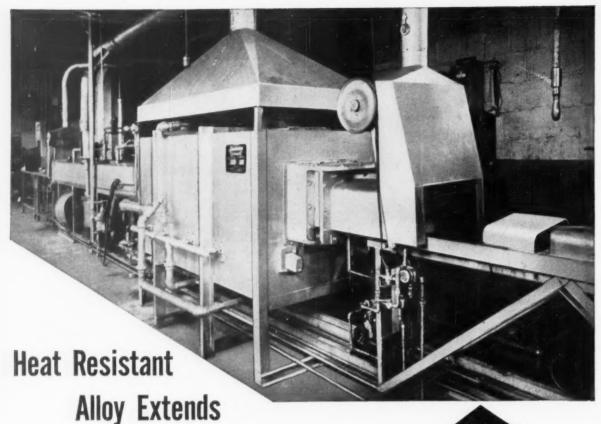


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7	8	9			
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Company-					and the same of th

to know about

Metal Cleaning



# Equipment Life Still good after 14 years

The muffle of this annealing furnace has withstood continuous alternate heating and cooling since 1940, except for a shut-down period during the Korean war.

Still in use 14 years after installation, this casting...produced in 35% nickel-18% chromium heat resistant alloy...demonstrates the economy of using nickel alloyed material to resist growth, warping, scaling and other deteriorating effects of heat.

From among the many engineering alloys containing nickel, you can select a material to provide the best set of properties for meeting one or a combination of requirements.

Let us help you find practical solutions to your metal problems. Make use of our counsel and data based on years of specialized experience in the fabrication, treatment, properties and performance of alloys containing nickel. Send us details of your problems for our suggestions. Original Muffle ...cast in a 35% nickel-18% chromium heat resistant alloy, trade-named "Chromax," and produced at the Harrison, N. J., plant of Driver-Harris Company... still serves after 14 years in this gas fired, controlled atmosphere, pusher-type furnace manufactured by Sunbeam Corporation, Industrial Furnace Division, Chicago 23, Ill.



**Heat Resistant** nickel-chromium alloy is also used for the annealing furnace conveyor.



THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y



### Strength at the 43 Sheave Points

The two upper photos show points high above the deck of a 50 ton floating crane. This huge equipment, including both crane and seagoing barge, was built by Wiley Manufacturing Company, Port Deposit, Md. It can be towed for long distances, even across the ocean if need be.

In view of the heavy loads to be handled, the Wiley designers foresaw the importance of rugged steel sheave wheels – sheaves that would last a long time under the heavy pressures of the cables. In making their choice, they selected Bethlehem forged-androlled sheave wheel blanks, which were furnished rough machined. This particular job required 43 sheaves ranging from 20½ to 40 in. OD.

Sheave wheels, of course, are but one of the many uses for Bethlehem



circular blanks. These sturdy steel products, available in a large number of sections and sizes, are excellent for gears, crane wheels, flywheels, turbine rotors, industrial wheels, and many other parts requiring high strength without excessive weight.

If you haven't used Bethlehem blanks in your own operations, we suggest you give them a try. Sizes run from 10 to 42 in. OD, and the blanks can be furnished untreated or heattreated, as desired.

Why not ask for details? Write or phone today, and we'll gladly furnish complete information.

BETHLEHEM STEEL COMPANY BETHLEHEM, PA.





BETHLEHEM FORGED-and-ROLLED CIRCULAR BLANKS

THE ONE YOU WANT?



NO NEED to search through directories or ask people about it. When you need a finished bearing, a bar of bearing bronze or any other one of countless items of industrial materials and equipment, just phone your industrial distributor.

YOUR BUNTING distributor is the leading industrial distributor, or a stock-carrying specialist in certain industrial items. With moneysaving convenience, he can supply hundreds of different sizes of completely machined and finished Bunting Standard Stock Industrial Bearings, Electric Motor Bearings and Precision Bronze Bars.

Ask him for a Bunting Catalog which gives complete dimensional

and technical data.



BRONZE BEARINGS . BUSHINGS . PRECISION BRONZE BARS

The Bunting Brass & Bronze Company • Toledo 1, Ohio • Branches in Principal Cities • Distributors Everywhere

### Vanadium-Alloys

announces

a new FREE MACHINING

of free-machining steels\*

in the following important tool-steel grades

### HIGH SPEED STEELS

RED CUT SUPERIOR FM VASCO SUPREME FM NEATRO FM VASCO M2 FM **8N2 FM** VAN-LOM FM

DIE STEELS

series

OHIO DIE FM

CROCAR FM

SPEED CUT

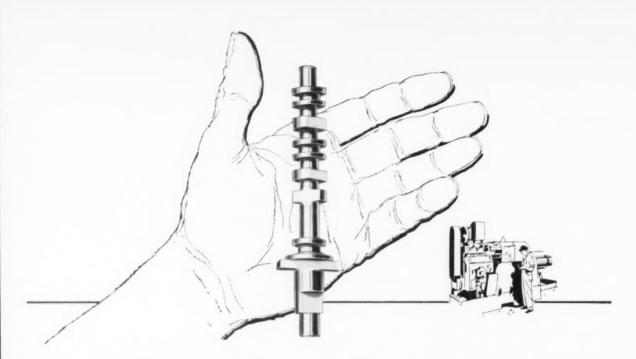
For tool steel applications where free machining quality is desirable, we offer this new FM Series. Vanadium-Allovs FM steels machine more easily, permit better machined finish, and in certain instances show improved performance. To obtain free machining characteristics in the

nationally-known steels listed above, simply specify the brand name desired, followed by the letters FM.

Complete information on our FM steels is available from your Vanadium-Alloys representative. Ask him for the facts.

STEEL COMPANY LATROBE, PA.

COLONIAL STEEL DIVISION . ANCHOR DRAWN STEEL CO.



## MACHINABILITY CAN HELP YOU GET THE MOST OUT OF YOUR AUTOMATICS

• Are you getting the speeds and feeds you really could out of your automatics? Are you sure you couldn't produce more parts at lower unit cost?

The answer may be in the machinability of the steel you use. And that's why we at Union Drawn are so fussy about our steels.

Just to make sure that you get the most out of the Union Drawn Steels you buy from us, one of our metallurgists or machining engineers will be glad to work with your set-up man. They can swap hints on tool angles, heavier speeds and feeds, and the best ways to run Union Drawn Steels in *your plant* on *your machines*.

The result? More parts in the pan, fewer in the reject box. Production is maintained or increased. So are profits.

Remember: the most important factor that influences unit parts costs is the *machinability* of the steel you use. And at Union Drawn, *machinability* is our prime concern. When may we tell you about it?

### REPUBLIC STEEL CORPORATION

Union Drawn Steel Division • Massillon, Ohio GENERAL OFFICES • CLEVELAND 1, OHIO Export Department: Chrysler Building, New York 17, N.Y.

Free-Machining Bessemer Alloy and Enduro Stainless Steels

Union Cold Drawn Special Sections

Union Cold Drawn and Ground Rounds; Turned and Polished Rounds; and Turned, Ground and Polished Rounds (Union Precision Shafting) REPUBLIC Union REPUBLIC STATE STATE

Need Shapes and sizes of carbide?



We <u>press</u> or <u>preform</u> to your designs in CHILLIA

### to save you expensive grinding!

### CARMET CATALOG

Just out . . . 32 wellillustrated pages, containing data on all Carmet grades, and on Carmet blanks, tools, die sections, punches, draw die inserts, etc.; also special preforming to order. • Write for your copy.

ADDRESS DEPT. M-52

When the exact shape and size of Tip you need is not to be found in carbide producers' catalogs, what should you do?—(1) order the Tips that seem to be adaptable, and then go to the expense of grinding them down to suit—or (2) ask CARMET to build you a die that presses the Tips to your designs? The answer is obvious! Save costly grinding.

Each one of the designs pictured above was pressed or preformed by us in quantity to the specific requirements of some individual customer. No excess metal remained for costly removal.

For suggestions, call or write your nearest A-L representative today. • Allegheny Ludlum Steel Corporation, Carmet Div., Wanda & Jarvis Aves., Detroit 20, Mich.

For complete MODERN Tooling, call Allegheny Ludlum





You can give duplicate steel parts added strength and increased heat- and corrosion-resistance... and still get economical automatic production.

Simply convert to free-machining ENDURO Stainless Steel Bars. They're cold-finished by Republic's Union Drawn Steel Division to give you close tolerance, accuracy of section, uniform soundness, and fine surface finish...plus the high physical and chemical properties of stainless steel. Two grades are

fully 90% as machinable as regular Bessemer screw stock.

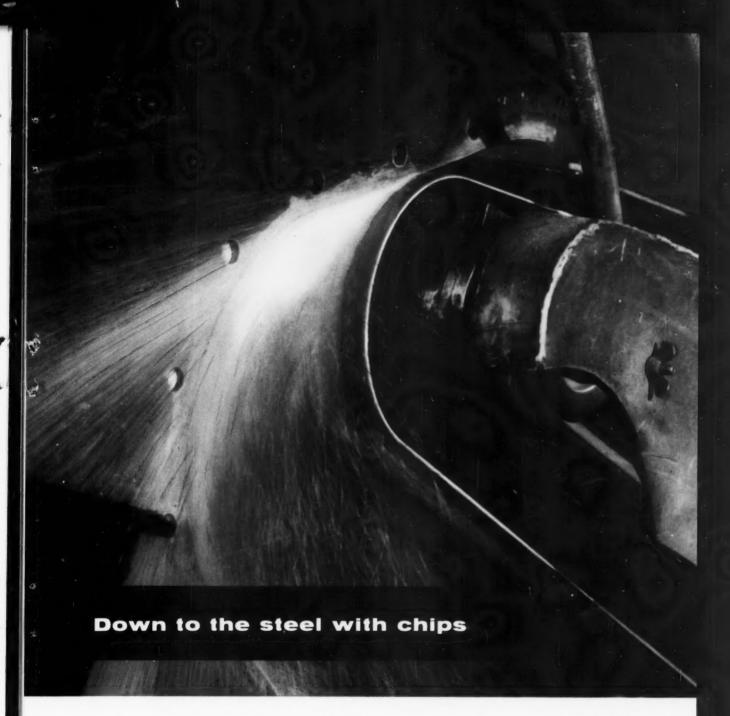
Free-Machining ENDURO also is available in hot-rolled bars and in wire. Republic metallurgists give prompt, obligation-free assistance on applications, processing and use.

### REPUBLIC STEEL CORPORATION

Alloy Steel Division • Massillon, Ohio GENERAL OFFICES • CLEVELAND 1, OHIO Export Department: Chrysler Building, New York 17, N. Y.

REPUBLIC ENDURO REPUBLIC MACHINIA STAINLESS STEEL

Other Republic Products include Carbon and Alloy Steels — Titanium — Pipe, Sheets, Strip, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing



A glance at the spark flow tells you this CARBORUNDUM® Brand Abrasive Belt removes huge amounts of stock ... fast. But that's not all-it also produces uniform finish, eliminates extra operations. The versatility and economy demonstrated by this swing frame belt grinder is yours to command on any metalworking operation, from deburring and polishing to weld grinding and snagging, with Abrasive Belts by CARBORUNDUM. They cut fast, cool...give smooth, even finish...long, useful life. Whether you use 1/2" belts on deburring machines, 74" belts on stainless steel sheet polishers - or any size between-your CARBORUNDUM Distributor is a good man to know. He offers expert counsel, complete stocks, prompt service.

Through application "know-how" and product quality

### CARBORUNDUM

continually puts more sense in your abrasive dollar



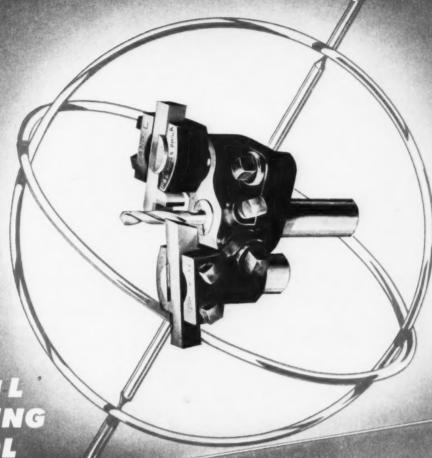
Slice through any metal in seconds -12 to 20 times faster than with a power hacksaw. Keep tolerances within thousandths . . . eliminate deburring and smoothing needed after shearing or flame-cutting. Do all this—and lower production costs, too-with Abrasive Cut-Off Wheels by CARBORUNDUM. Rubber Bond for wet cutting . . . smooth, clean, closetolerance cuts-free from burr, discoloration and other surface change. Resinoid Bond for dry cutting... when speed is more essential than fin-

ish. Tough, reinforced CARBOFLEX Wheels for more severe operations, including portable cut-off. Get expert counsel from your CARBORUNDUM Distributor or Śalesman. He's ready to serve you - with complete stocks, prompt delivery.

Through application "know-how" and product quality

continually puts more sense in your abrasive dollar





R and L TURNING TOOL

Replaces an assortment of

fourteen different tools . . . changes from

right to left in ten seconds . . . no misalignment . . .

extremely fine adjustment provided . . . for rough and

heavy cuts as well as finishing cuts . . . The R and L TURNING TOOL is constructed with best possible care and of finest steel.

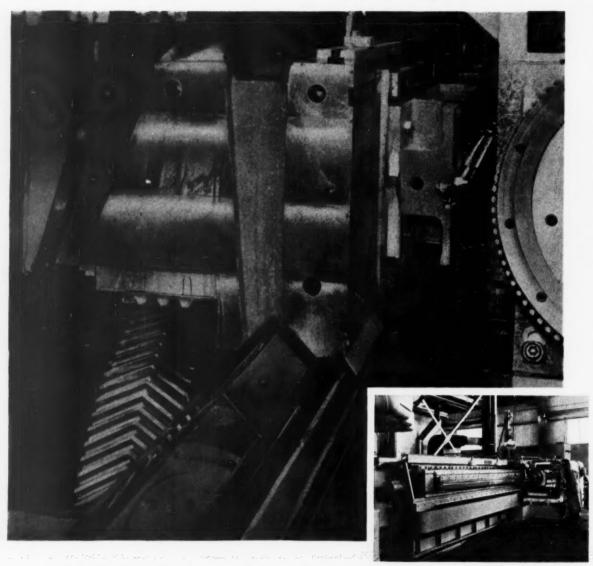
Write for Catalog

SEE R and L TOOLS AT BOOTH NO. 134 INDUSTRIAL EXPOSITION, PHILADELPHIA APRIL 26-30.



1825 BRISTOL STREET . PHILADELPHIA 40, PA.

TURNING TOOL · CARBIDE OR ROLLER BACKRESTS · RELEASING OR NON-RELEASING TAP AND DIE HOLDERS, (ALSO FURNISHED FOR ACORN DIES) · UNIVERSAL TOOL POST · TURRET BACKREST HOLDER · CUT-OFF BLADE HOLDER · RECESSING TOOL · REVOLVING STOCK STOP · FLOATING DRILL HOLDER · KNURLING TOOL



# 300 FPM Lapointe broaching machine has Farrel® herringbone rack drive

The Lapointe horizontal and vertical broaching machines, with electro-mechanical drive, are outstanding developments in broaching. The horizontal machine shown here is capable of broaching many jobs heretofore impossible, at speeds up to 300 FPM and more.

Farrel continuous tooth herringbone rack and gears drive the main slide. The quiet, vibration-free performance of this drive, which results from extreme accuracy of tooth spacing, contour and helix angle, is an important factor in attaining broaching smoothness at these high speeds.

Farrel herringbone gears are made of the finest grade materials, in any size from ½ inch to 20 feet in diameter. Also available are straight tooth and single helical gears in sizes up to 20 feet diameter, and internal gears with either spur or helical teeth up to 16 feet diameter.

A Farrel engineer is available for consultation at your convenience, without obligation.

### FARREL-BIRMINGHAM COMPANY, INC. ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Boston, Akron,
Detroit, Chicago, Memphis, Minneapolis, Portland (Oregon),
Los Angeles, Salt Lake City, Tulsa, Houston, New Orleans.

Farrel-Birmingham

For more information on products advertised, use Inquiry Card, page 261



Big planers are usually slow planers. But not a GRAY! Bucyrus-Erie found that out when they put a new GRAY 132" x 120" x 50' Heavy Duty Planer to work. This precision GRAY with modern high speeds and operating conveniences is machining a 55' long side section of revolving frame of a Bucyrus-Erie dragline . . . . a big mouthful in any shop. Again, performance is proving that planer jobs don't grow old on a GRAY.

Write today get the story on HIGH tow cost PRODUCTION

DEPT. 8

The G.A. GRAY Company

pleaser type milling machine bertpantut boring machines

that move

**MOUNTAINS** 

CINCINNATI 7, OHIO, U. S. A.

SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. . SOLD IN THE CANADA BY DECEMBER AND SAME

### HERE IS FLEXIBILITY

# ALL MACHINING ON LOIZES EIGH MOTOR FRAMES

Completed on NATCO Machines

- MILLED
- DRILLED
   S HOLES AND COMB.
   DRILL & REAM 2 HOLES
- ROUGH BORED
  S DIAM. UP TO 141/2"
- ROUGH FACED

- FINISH BORED
  - DIAMETERS BOTH SIDES
- FINISH FACED
   BOTH SIDES
- DRILLED
   4 END HOLES
   BOTH SIDES
- TAPPED
  - 4 END HOLES BOTH SIDES

Additional holes not shown but completely drilled and tapped are the specification plate holes, eye bolt hole and conduit box holes.

The state of the s

### NATCO ENGINEERED

for quality and quantity production

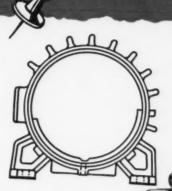
8 SIZES

MILL & DRILL

48

MOTOR FRAMES

PER HOUR



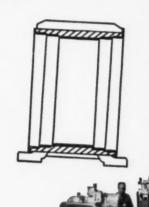
MILL 4 FEET PADS DRILL 3 HOLES COMB. DRILL AND REAM 2 HOLES



BORE TO 3
DIAMETERS
AND FACE BOTH SIDES

31 MOTOR FRAMES

PER HOUR



Call a Natco Field Engineer

to help you solve your problems in Drilling, Boring, Facing and Tapping.



NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

Branch Offices

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BUFFALO, 1807 Elmwood Ave. • NEW YORK, 35 Beechwood Ave., Mount Vernon

# assure long life for expensive dies?

# DANLY PRESSES help solve the problem

Costly dies prepared for stamping motor armature laminations represent an investment that must pay off in production efficiency. Along with die design and material handling methods goes the selection of the right presess to insure this die performance.

Danly's rigid, balanced, precise construction decreases vibration and deflection, increases die life. In General Electric's plant at Erie, Pa., Danly Autofeed Presses are helping to make investment in lamination dies pay off. The slide to bed parallelism of these Presses was set to a total variation of only .002" at installation. After 2 years of operation, this original setting has not varied!

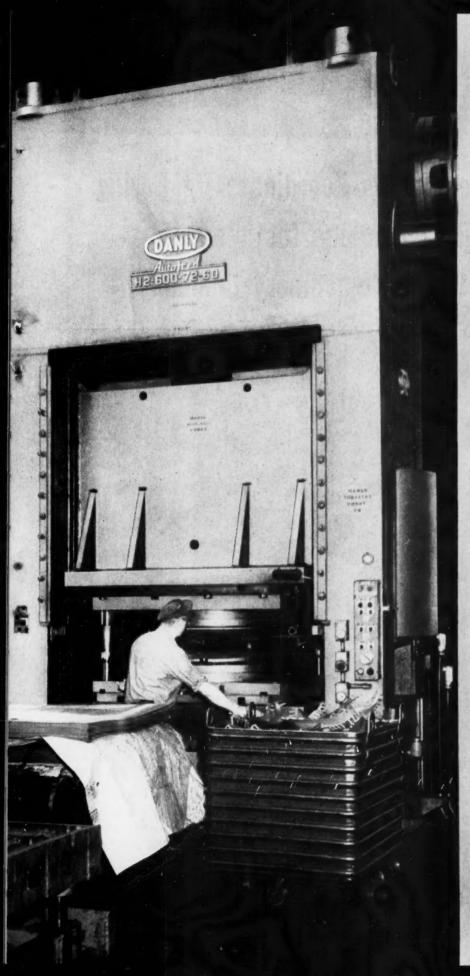
There are basic reasons for Danly Press precision performance . . . and definite reasons why management finds it pays to be cost conscious instead of price conscious in purchasing mechanical presses.

DAWLY MACHINE SPECIALTIES, INC.

STAN Street & comming their sect Children St. Wheels

PROVED AGAIN ... It costs less to run a DANLY PRESS!

If your manufacturing process involves high production and expensive dies, it will probably be worth your while to talk with a Danly Press Engineer. Cell now—he will be glad to discuss your specific problems. There is no obligation for this service.





### Steady, Uninterrupted Output

Records show that this 600 ton Danly Autofeed Press has required remarkably little maintenance since installation. Far greater frame rigidity protects punch die and press, permits tight quality control, assures longer production runs at higher operating speeds.



### **Automatic Oil Lubrication**

Gibs are automatically lubricated with oil permitting closer, more precise slide alignment. Slide to bed parallelism of .002" has been maintained for over 2 years with resulting advantage of longer die life. Oil lubrication is also automatically supplied to all drive elements.



### **Automatic Piece Part Handling**

General Electric engineers designed and built the automatic extracting mechanism shown. This device extracts both center hole slug and finished 43" lamination from the 600 ton Danly Autofeed Press shown at left and deposits them in two easily handled stacks.

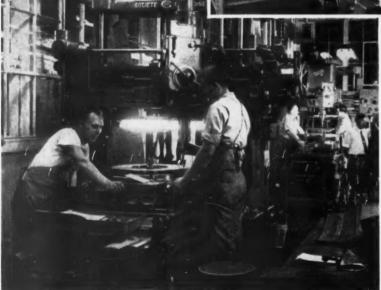


MECHANICAL PRESSES 50 TO 3000 TONS SINGLE, DOUBLE, TRIPLE ACTION AUTOFEED UNDERDRIVE

# World's Largest Three-Coordinate Jig Boring and Milling Machine Installed at Hartford Special Machinery Company

The latest addition to the complement of fine precision tooling at the Hartford Special Machinery Company of Hartford, Conn., is the SIP Hydroptic 8P illustrated at the right. The photograph shows Hartford Special's President, Mr. Robert Merritt (in shirt-sleeves) proudly displaying the new acquisition to Mr. F. P. Maurice, Managing Director of the Societe Genevoise D'Instruments de Physique, Geneva, Switzerland. The machine becomes





the fifth in the battery of SIP Hydroptics now in operation in Hartford Special's modern toolroom illustrated on this page.

The new Hydroptic 8P Jig Boring and Milling Machine, equipped with a  $61.5'' \approx 40.5''$  table, features a 55-inch table travel, a 40-inch traverse travel of the vertical spindle head, and a 28.5-inch vertical travel of the horizontal spindle head. Drilling capacity 2%''; boring capacity 10''. Hydraulic milling feeds up to 12-inch/min.

126-MACHINERY, April, 1954



Three-coordinate settings, with standard scales magnified 21x are projected on viewing screens for both speed and convenience. SIP guarantees that the maximum error between any two positions of the table or the spindle heads compared with the readings on the projection screens is inferior to 0.0002 inches.

SIP Hydroptic Jig Boring and Milling Machines are in

For more information on products advertised, use Inquiry Card, page 261

operation from coast to coast in the most prominent plants for high precision production and tool work. Their popularity is due in part to (1) their exceptionally large productive capacity, (2) ease and speed of operation, (3) outstanding flexibility and (4) the SIP tradition for permanent precision. These machines are distributed in the U.S.A. by American SIP Corporation, 100 East 42nd Street, New York 17, N. Y.

MACHINERY, April, 1954-127

# UNIVERSAL DRILL BUSHINGS OUTLAST THEM ALL!

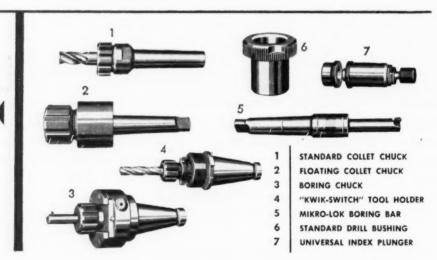
Several factors contribute to the long life of Universal Drill Bushings.

They are machined from an unusually high quality steel. Their superhoned bores reduce wear. The blended radius on the top inside diameter helps prevent tool hang-up and breakage. 100% concentricity and hardness tests help guarantee their accuracy and uniform quality. Knurled heads provide a quick, sure grip. Available in a complete range of standard sizes and lengths. Orders for special dimensions will receive prompt attention. For complete information, write to the office nearest you — Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis. — or our home office.

180

### UNIVERSAL ENGINEERING COMPANY

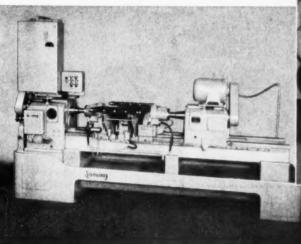
FRANKENMUTH 2, MICHIGAN



## MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE So-owing PEOPLE" SENECA FALLS, NEW YORK

Lo-swing Model CS Automatic Drilling and Centering Machine equipped with Automatic Handling Mechanism and Special Vises.

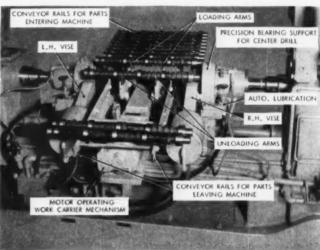


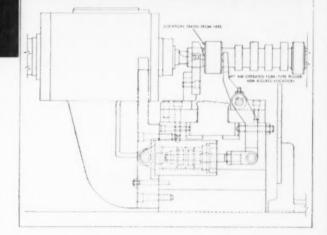
### AUTOMATIC HANDLING CUTS CAMSHAFT CENTERING COSTS

**PROBLEM:** To automatically handle and center both ends of eight-cylinder camshafts.

**SOLUTION:** The standard *Lo-swing* Model CS Automatic Drilling and Centering Machine selected for this job was equipped with a special Automatic Handling Mechanism and special vises. The close-up illustration provides a rear view of the vises, loading and unloading arms, and rails which guide the camshaft through the machine.

The camshafts arrive at the machine from the previous operation by conveyor and roll down to a fixed stop on the loading rails. At the end of the machine cycle, the center drills retract and the vises open, allowing the finished piece to drop into a stationary cradle, which is positioned slightly lower than the center line of the vise jaws. An electrical contact then starts the work carrier motor, imparting a rotating movement to the work carrier arms which handle a rough and finished piece simultaneously.





The unloading arms remove the finished piece, depositing it on the conveyor rails leaving the machine, while the loader arms, in their trajectory, pick up a rough part and lower it into the vise jaws where it is automatically clamped in position. The machine starting clutch is then automatically engaged and the part centered, which completes the cycle. The entire operation is automatic, no operator being required.

The close-up illustration shows a finished part being removed from the vises and a rough part just being lowered into the vise. The line drawing shows the details of the automatic positioning stop attached to the left hand vise. Seneca Falls engineers are at your disposal for solving your AUTOMATION problems.

PRODUCTION COSTS ARE LOWER WITH So-swing

# Bingham-Herbrand Corporation MAXIPRESSES and REDUCEROLLS

THE 20th CENTURY FORGE SHOP at Bingham-Herbrand, Fremont, Ohio

The efficient and highly productive Aviation Division of the Bingham-Herbrand Corp., Fremont, Ohio, relies entirely upon National for its heavy forging equipment. At full operating capacity, these Maxipresses and Reducerolls are capable of

At full operating capacity, these Maxipresses and Reducerolls are capable of producing exceptionally large quantities of precision forgings every day! This primary forging equipment includes:

- 4 2500-ton Maxipresses
- 6 2000-ton Maxipresses
- 6 1300-ton Maxipresses
- 2 700-ton Extrusion Maxipresses
- 5 No. 6 Reducerolls
- 1 No. 4 Reduceroll

Among the reasons underlying Bingham-Herbrand's exclusive preference for Maxipresses and Reducerolls are:

- Newest design to have been exhaustively proved in actual forge shop conditions.
- 2. Availability of National's continuing engineering assistance on die problems.

If you have a forging problem—large or small, hot or cold, ferrous or non-ferrous—let us help you solve it. Send us prints, or a sample part, or, better yet, visit us. No obligation.

### NATIONAL MACHINERY COMPANY TIFFIN, OHIO — SINCE 1874

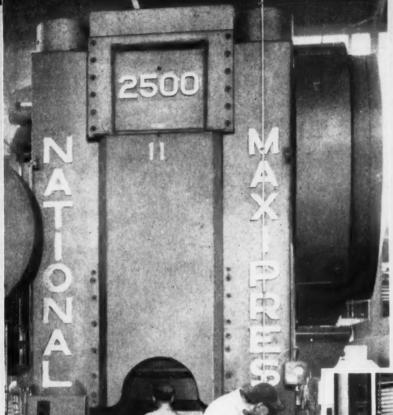
DESIGNERS AND BUILDERS OF MODERN FORCING MACHINES . MAXIPRESSES . REDUCEROLLS . COLD NEADERS . BOLTMAKERS . NOT FORMERS . TAPPERS . MAXIMAKERS

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Detroit

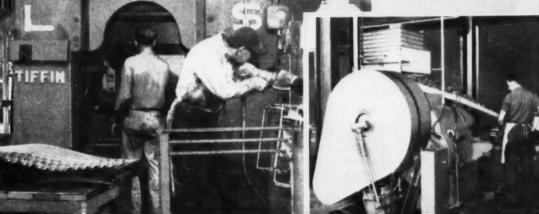
Chicago

# Relies Entirely on NATIONAL for Modern Precision Forgings!



This 2500-ton Maxipres (one of 18) now in production in the modern forge shop of the Bingham-Herbrand Corp.

Six Reducerolls at Bingham-Herbrand quickly preform jet aircraft engine blade and bucket blanks for finish forging in Maxipresses.



### NATIONAL MACHINERY COMPANY

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES . MAXIPRESSES . REDUCEROLLS . COLD HEADERS . BOLTMAKERS . NUT FORMERS . TAPPERS . MAILMAKERS

Hartford

Detroit

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What makes a "Red End" Blade cut better, last longer on the average than other blades? The answer's in the picture. Every "Red End" tooth takes exactly the same bite, curls the chip like a cutting tool on a lathe.

Because every tooth in every "Red End" Blade is exactly the same. It's all in the way we pour and roll our own steel... the way we mill the teeth to exact size and shape... set them evenly and accurately... and the special way we heat-treat them to a uniform hardness never believed possible before.

The result is faster, straighter cutting, and many more cuts per blade. If you haven't tried them yet—your local Industrial supply Distributor stocks 'em. Get some today and see.



Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon Canadian Factory in Montreal, Que. Simonds Divisions: Simonds Steed Mill, Lockpors, N. Y. Simonds Abrasive Co., Phila., Pa. and, Arvida, Que., Canada There's a RED END Blade For Every Job



HIGH SPEED MOLYBDENUM — the RED Blade for cutting mild alloy steels and general pur-



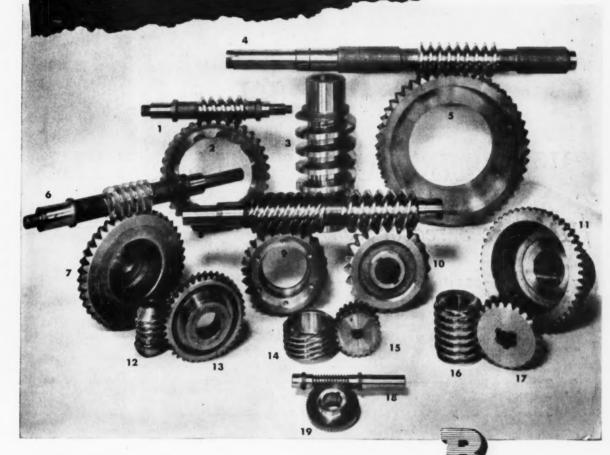
HIGH SPEED TUNGSTEN — the GREY Blade for cutting hard alloys and stainless steels.



HIGH SPEED WELD-EDGE — the SHATTERPROOF Blade for use where maximum safety is required.

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MADE TO YOUR SPECIFICATIONS!!



Be sure you have the exact gear you want --a QUALITY GEAR made to your particular requirements - checked 100% for tooth contact, center distance and Rockwell Hardness - at the right price too!!

BAUSH WORMS AND GEARS shown are a product of over 500 worm gear hobs we maintain at all times. Ranging from sets on 21/8" center to 28" center, they cover up to and including 2" circular pitch.

YOUR SPECIFIC GEAR NEED CAN BE DESIGNED AROUND THESE HOBS ELIMINATING EXPENSIVE TOOLING AND DELAY.

Write for Catalog No. 12A or send us your prints there is no obligation.

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- 1 & 2 Lift Truck
  - 3 Bending Roll Drive
  - For Multiple Spindle Lathe
- 6 & 7 Agitator Drive
- 8, 9 & 10 2-Speed Lathe Reduction
  - 11 Mixing Machine Gear
- 12 & 13 Hourglass Type Worm & Wheel
- 14 & 15 Lubrication Pump Drive
- 16 & 17 Feed Drive-Automatic Machine
- 18 & 19 Cutter Drive-Keywaying Machine



This symbol identifies the National Machine Tool Builders' Association—a group of 196 manufacturers of machine tools, 148 of these companies, or 3 out of 4, are using Garlock KLOZURE Oil Seals.

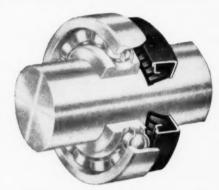
# 3 out of 4

# Machine Tool Builders use Klozure\* Oil Seals

### Here are 3 reasons why-

- 1. The Klozure Oil Seal is a precision-made product, so necessary for all components of the tools which are designed for fine precision machining.
- 2. KLOZURES are uniform—both in sealing contact and in spring load.
- 3. KLOZURE Oil Seals are extremely efficient—they provide effective sealing with a minimum of power loss and heat generation.

For positive bearing protection specify Klozure Oil Seals for your machinery. Klozures are made in many models and a complete range of sizes. Get all the facts—call your Garlock representative or write for Klozure Catalog No. 10.



Model 53 finger spring KLOZURE, for normal and high speed service, applied to a shaft to protect the ball bearing.



Model 51 — A general purpose finger spring



Model 63 — A general purpose finger spring seal for normal and high



Model 65 — A general purpose garter spring seal for normal and high speed service.



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THE HYDRAULIC PRESS MFG. COMPANY

MOUNT GILEAD OHIO, U. S. A.

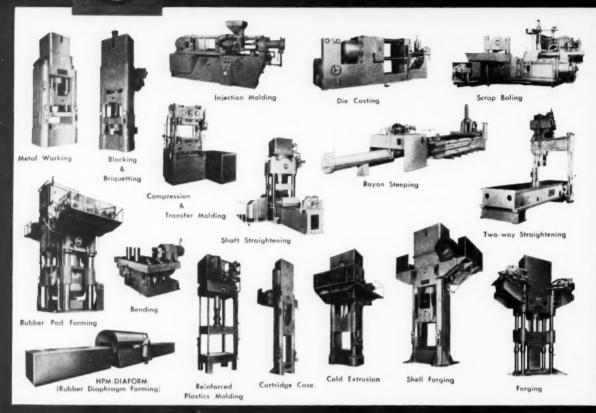
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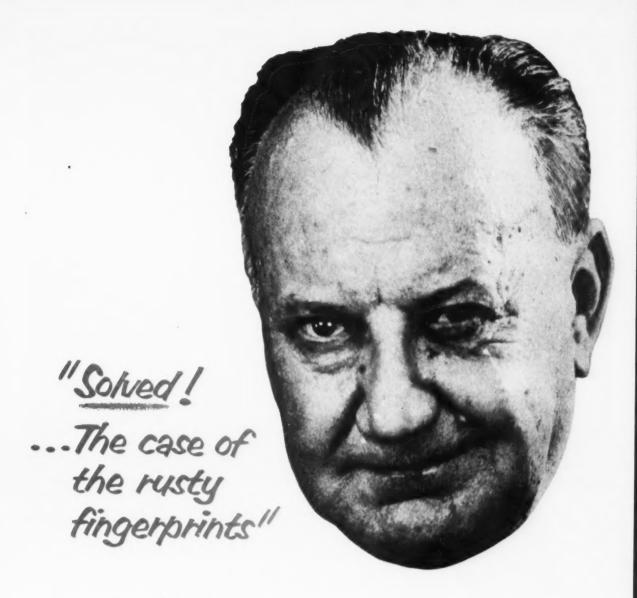
### EXPORT DEPARTMENT

MOUNT GILEAD, OHIO
The Hydraulic Press Mfg. Co.
CABLE ADDRESS: "HYDRAULIC"

-



THE HYDRAULIC PRESS MFG. CO. MOUNT GILEAD, OHIO, U. S. A.



On one of his periodic visits to a large piston ring manufacturer, Sinclair Lubrication Engineer Don Rigg ran into a peculiar rusting problem. Mr. Rigg reports, "Customers were returning a considerable number of the company's rings because of rust spots and rusty fingerprints. Observation of the manufacturing process showed the rings were dipped in a rust preventive oil after being machined, then they were packaged and stored. The fingerprints could only have come from the packers and were due to failure of the rust preventive."

Mr. Rigg continues, "I recommended the use of Sinclair RUST PREVENTIVE 142 because it imparts a tough, protective film, impervious to finger marks and metal to metal contact. The fact that this company switched to Sinclair RUST PREVENTIVE 142 and has been using it exclusively for 3 years is ample proof of results."

### SINCLAIR LUBRICANTS

Why not give a Sinclair Lubrication Engineer the chance to help solve *your* rust and lubrication problems. *There's no obligation*. Contact your local Sinclair office or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N.Y.



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- If you use taps in just one kind of
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- Then order 'DETROIT' Specific taps for that material.
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Every 'DETROIT' Specific tap is clearly marked on the shank with the name of the specific material for which it is ideally suited. Ask for Catalog-Bulletin #ST-53.





precision-pierced parts of these and similar products are produced in small lots with low tooling cost

WITHOUT LAYOUT - WITHOUT SET-UP



A WIEDEMANN PIERCES SMALL LOTS COMPLETE, IN LESS TIME THAN LAYOUT BY CONVENTIONAL METHODS

We'll gladly make a time study on your work.

## WIEDEMANN MACHINE COMPANY

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# HITS THE JACKPOT!

With a combination of "AMERICAN" Hole Wizard Radial Drills and ingeniously designed fixtures Ryan Aeronautical Company of San Diego, California, produces Aft Frames for the General Electric J-47 jet engine in record time.

The operations performed include precision boring, facing and undercutting of the stainless steel support flanges. Close tolerances must be and are held.

Credit is due the "Ryan" engineers for developing such workable and time saving fixtures. Credit is also due the "Ryan" officials for selecting "AMERICAN" Hole Wizard Radials as part of the "winning combination."

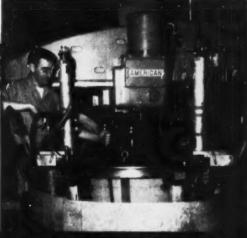
"AMERICAN" Hole Wizards are sturdy; they are powerful; they are easy to operate and they retain their original accuracy for years to come. For substantiation just ask the operator.

Bulletin No. 315

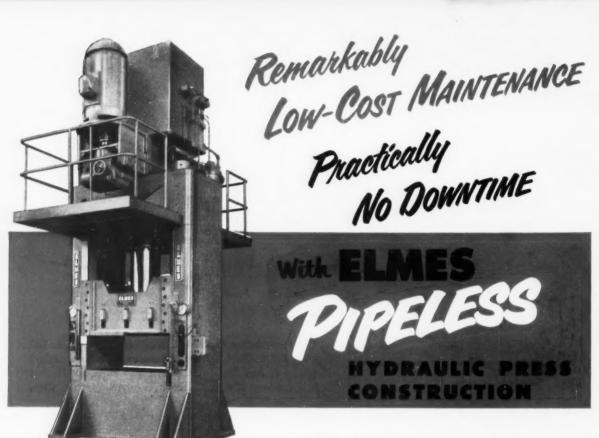
AMERICAN

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LATHES AND RADIAL DRILLS

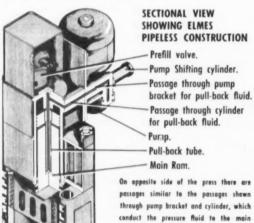


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HIGH-SPEED "PIPELESS" PRESS with two reversible pumps

450-Ton Elmes Single-Action Metal Drawing & Forming Press, with many special features including the revolutionary Elmes Pipeless construction. This press employs two reversible pumps, providing the following operating speeds per minute: advance—550\*, press—126", return—550".



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This exclusive Elmes® Press design has put an end to high-pressure piping troubles. The main hydraulic circuit in these Elmes Presses has no piping! The advantages of this unique pipeless construction, proved by wide-spread use throughout industry over an extensive period, assure a radical reduction in maintenance cost, with virtual elimination of downtime.

In Elmes Pipeless Presses, all high-pressure hydraulic fluid is conducted through short, direct passages drilled in the structural parts. There are no high-pressure screwed joints to loosen, no oil dripping from loosened fittings, no breaking of welded joints. Press operation is smooth, quiet. Reversal of the ram is shockless. Vibration is greatly reduced. Turbulence and oil heating are minimized. Response to electrical controls is prompt and precise.

Any Elmes Metalworking Press, standard or special, can be equipped with pipeless construction—and at no premium. Find out now how your production will benefit from the matchless performance of Elmes Pipeless Hydraulic Presses. A formal proposal to suit your particular requirements, or further information, will be promptly supplied on request. Contact your Elmes Distributor or write us direct.

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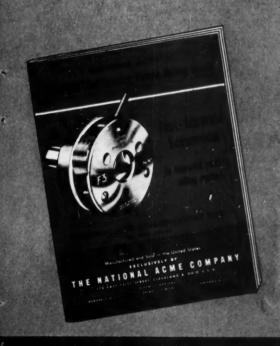
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FASTER
SMOOTHER
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than any other tool





It's the new self-opening head that saves backing-off time, produces rolled threads at rates equivalent to turning speeds with uniform precision including class 3 threads, or better.

Fette differs from other methods—the material flows in an axial direction—generates the thread ahead of the rolls without breaking grain structures. This insures full depth of thread and avoids cratered crest—for denser, smoother more wear resistant threads.

Quick and permanent diametric adjustment is easily made and rigidly held. No lead screw or follow-up cam required.

Revolving type heads in sizes  $\frac{7}{16}$  to 1", non-revolving type from  $\frac{7}{16}$  to  $\frac{3}{1}$ "—for all standard parallel thread forms.

If you roll threads, you can't afford to be without the information given in the bulletin shown. For quicker results send sample with full specifications.

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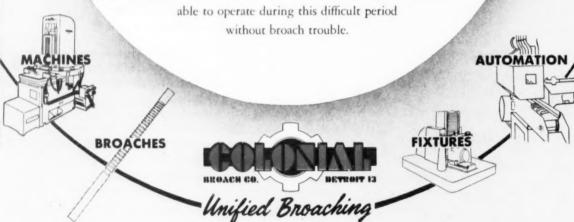
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# WHY WE ARE USING MORE COLONIAL BROACHES

by Plant Superintendent
Oil & Pipeline Valve Manufacturer

We feel that the long record of service we have received from Colonial Broaches should be noted. The company used its first Colonial Broach in 1927, and has been using them in generally increasing numbers ever since.

We were particularly gratified with their performance during World War II, when the quality of service, workmanship and material deteriorated in so many products. These broaches were maintained at their usual level in these respects and we were



## 480 BEARING CAPS PER HOUR with Stationary Broaches



Locating faces on automotive bearing caps are broached at the rate of 480 per hour with this ingenious setup. Bearing caps are guided past stationary adjustable broach inserts. Stock removal is .0045" on each side.

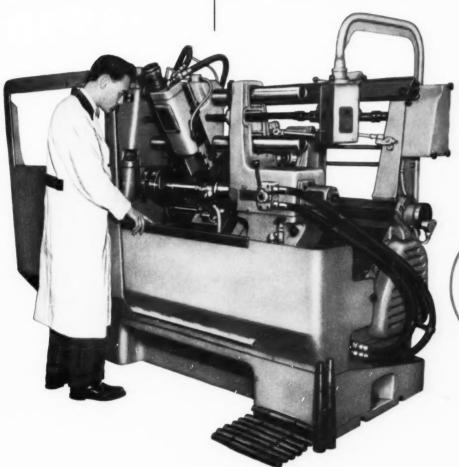
This horizontal Colonial model HB1 4-ton 12-in. stroke broaching machine operates on a semi-automatic cycle, with a maximum cutting stroke of 30 feet per minute. Maximum return speed is 60 feet per minute.

This is a Colonial Unified broaching installation

## Introducing the new American built...

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high speed Hydraulic copying Lathe



See its amazing speed at the A.S.T.E. EXPOSITION in PHILADELPHIA, April 26-30, Booth 509



Now completely built in the United States to

JIC standards by Industrial Metal Products Corporation,

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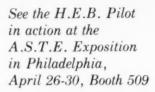
Turn the page to see the Pilot's outstanding features

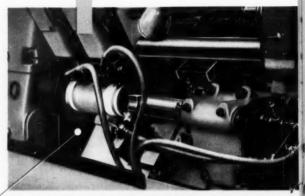
## Throughout the world...

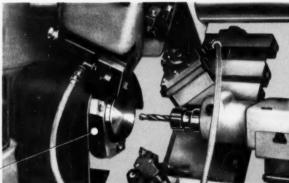
Progressive plants that demand the best say H.E.B. is "the way to turn"

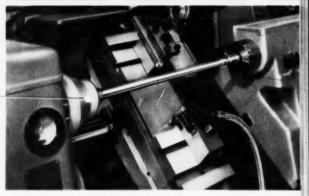
## CHECK THESE REASONS WHY:

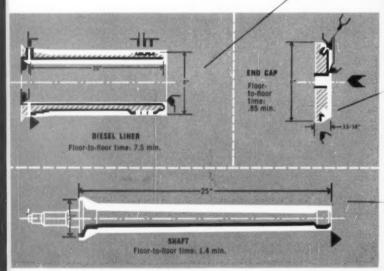
- · Completely automatic; operator only loads.
- Motors up to 60 HP; spindle speeds 380 to 3000 RPM.
- Standard power operated back tools can be used for copy turning, finishing or undercuts.
- Takes as many as eight different cuts in one cycle if necessary.
- Patented hydraulic carriage feed easily adjusted and vibration-free. Once set, remains absolutely constant.
- Accuracy of .0005" and 32 micro-inch finish obtainable.
- · Hydraulically powered infeed slides available.
- · Adequate coolant supply built into toolblock.
- Splash guard mounted on rollers.
- Fewer tools necessary, resulting in less down-time.
- Twin cross slides, infinitely variable spindle speeds for constant cutting speed available.











H.E.B. Hydraulic Copying Lathes are also manufactured in OP Models with 20 HP motor; take heavy cuts with carbide tools at spindle speeds 50 to 3600 RPM, economical for short runs . . . And in GT Models with rotating pattern designed to copy an infinite variety of non-circular work.

The new, fully automatic H.E.B. Pilot is a triumph of production engineering—culmination of years of brilliant research by H.E.B., specialists in lathe manufacture and pioneers in the field of copy turning.



H.E.B. MACHINE TOOLS, INC.
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COPYING LATHES • ENGINE LATHES WITH COPYING
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## .. FOR INSTANT OVERLOAD PROTECTION

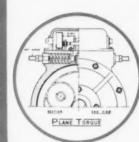
## PLANE TORQUE MOTO REDUCER

. . eliminates
shear pins,
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Here is a smooth running, trouble-free Motorized Speed Reducer . . . an "exclusive" product, whose design and construction is the result of 61 years of gear making and speed reducer experience. Built in two types, Horizontal and Vertical. The MotoReduceR has many original, outstanding advantages, each of practical value to industry:

- Planetary gear design provides better alignment of pinions and gears, which in turn reduces noise and wear.
- Permits greater reduction ratios in more compact unit than otherwise possible.
- Reducer can be readily disassembled for easy inspection or maintenance.
- Vertical units incorporate "dry well" construction, which eliminates possibility of oil leakage down output shaft.

## PLANETORQUE



PLANETORQUE is a feature that can be supplied with any Philadelphia MotoReduceR or Philadelphia Planetary Reducer. It safeguards both the driven machinery and drive unit from dangerous overloads. These units are widely used on stoker drives, conveyor drives, mixers, agitators, roll drives, and tumblers, where overloads or jamming may be encountered.

For further detailed information write for PlaneTorque Moto-ReduceR Catalog.

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MACHINERY, April, 1954-147



## Special U-clamps made on a DAKE press with this low-cost fixture

A few pieces of scrap steel, cut to size and welded, became the die with which this machinist forms U-clamps on his Dake Hydraulic Press.

He is Gerald Denicola, who operates the Marmora Machine Co. of Chicago. One of his customers orders these clamps 100 at a time, three or four times a year.

When he learned that there would be repeat orders for them, he rigged up the fixture shown above at a cost of less than \$15. It paid for itself

on the first run, and since then has paid "dividends" regularly every three or four months.

If you are hammering out jobs the hard way, imagine how much work and money you could save by doing them with a Dake Hydraulic Press. Hand, air, or electrically operated Dake Presses with capacities ranging from 25 to 300 tons are suitable for thousands of production and maintenance jobs. They are fully described in illustrated Catalog 129—write for a copy, today.

## Dake Engine Company, 604 Seventh St., Grand Haven, Mich.











7

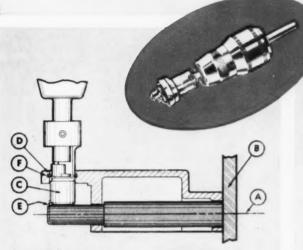


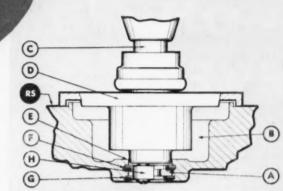
Gap Type



Movable

## Waldes Truarc grooving tool solves tough internal grooving problems, cuts costs in assembly-line production





Problem: Locating a Groove From Centerline of a Hole A.

- (a) Workpiece is fitted into plug on fixture plate B.
- (b) Bottom adaptor C on standard Waldes Truarc Grooving Tool is piloted into bore D and registers on side of plug F. Groove F is cut in exact location required.

spindle assembly C and special bushing D which spans large cavity permitting tool to register on reference surface RS. Bushing also pilots tool into counter-bore at f. (b) Both grooves f and G are cut simultaneously with spe-

(a) Waldes Truarc Grooving Tool is fitted with elongated

Problem: Cutting Two Grooves-One Rectangular, One Beveled - Located In Bore A In Large Cavity B of Workpiece,

and Located From Reference Surface RS.

cial form cutter # having both required contours.

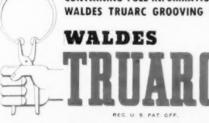
AMAZINGLY VERSATILE! The Waldes Truarc Grooving Tool adapts quickly and simply to your toughest recessing requirements. With it, even unskilled labor can perform and maintain high precision, mass production operations.

WIDE CUTTING RANGE! The Waldes Truarc Grooving Tool comes in five models: A-1, A-2, A-3, B and C. This wide variety of models enables you to cut accurate grooves in

housings with diameters from .250 to 5.00 inches. Special features, modifications and adaptations allow each model to operate efficiently under many varying conditions.

SEND YOUR PROBLEMS TO WALDES! Whatever your internal grooving problem, send us your blueprints and let Waldes Truarc engineers give you a complete analysis, price quotation and delivery information on the most economical tool set-up for your particular job.

WRITE NOW FOR 20-PAGE MANUAL CONTAINING FULL INFORMATION ON WALDES TRUARC GROOVING TOOL



GROOVING TOOL

MADE BY THE MANUFACTURERS OF WALDES TRUARC RETAINING RINGS. WALDES KOHINOOR, INC., 47-16 Austel Place, L. I. C. 1, N. Y. WALDES TRUARC GROOVING TOOL MANUFACTURED UNDER U.S. PAT 2.411,426

See the Waldes Truarc exhibit at the A.S.T.E. Show, April 26-30. Booth No. 424, Precision Hall

M046 Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y. Please send me your new 20-page technical manual on the Waldes Truarc Grooving Tool. Company

For more information on products advertised, use Inquiry Card, page 261

MACHINERY, April, 1954-149



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150-MACHINERY, April, 1954

For more information on products advertised, use Inquiry Card, page 261

By LORING F. OVERMAN

## Defense Problems Under an Economy-Minded Administration

How difficult it is to keep a defense program operating at top efficiency when there is no shooting going on is being demonstrated in Washington these days. In addition to the seeming lack of urgency, policy-makers get the idea that if a little economy in military spending is good, perhaps more would be better. Hence, having trimmed defense spending at several points, the economy bloc is looking for more corners to cut.

#### **ODM Under Scrutiny**

On two counts, the economizers are questioning the need for an Office of Defense Mobilization. One supposition is that with the defense program trimmed, perhaps ODM could be eliminated, leaving the Departments of Commerce and Defense to administer details. Then, too, the ODM is being judged on the past performance of similar agencies between periods of hostilities.

To any suggestion that it may not be essential, the Office of Defense Mobilization has counterarguments. The principal one is that the constantly changing defense picture virtually defies advance projection.

The recent complete change in defense policy-stressing radar-pushbutton weapons and instant retaliation via atomic power-has required revision in mobilization planning. As a result. Defense Mobilization Director Arthur S. Flemming has delayed his promised report on the status of 1953 progress, as well as probable future requirements. Based on preliminary data, however, he announced that there is need for further expansion of defense facilities in ninety industries. Some of these are expected to move up to quota with little difficulty, while others will require special incentives.

Some Department of Defense people contend that there is no such thing as realism in defense planning. When no one is using hand grenades, for example, even a pilot order is unrealistic. But if there is a sudden demand for grenades, quantities considered realistic are immediately inadequate. This reasoning explains much of the disagreement between the military and the civilian planner.

#### Procurement Task Force

Government procurement, both civilian and military, will soon come in for another critical study as the result of a special task force appointed by former President Herbert Hoover. Chairman of the group of ten big-name industry people is Robert W. Wolcott, chairman of the board of the Lukens Steel Co. The machinery industry's representative is Charles J. Stilwell, president of the Warner & Swasey Co.

The committee is directed to study (1) methods of standardizing, simplifying, and improving the nomenclature of procurement articles; (2) inventory policies; (3) weaknesses of the present system of setting requirements and purchasing; (4) the current system of awarding contracts (including organization and authority of procurement units in government departments and agencies), the various types of contracts used, and the method of distributing contracts: (5) procurement law, including directives, regulations, procedures, and other types of instructions used to implement the statutes; (6) the administration of contracts, including inspection, changes, financing, and pricing; and (7) executive procurement personnel.

#### Machine Tool Policies Still in Flux

Just to keep the record straight, there are two government policies for handling machine tools. One, dealing with surplus tools owned by the Department of Defense, is administered by the Defense Department. The other policy, established by the Commerce Department, is concerned with machines belonging to the Atomic Energy Commission; Maritime Administration; Department of Health, Education, and Welfare; and the General Services Administration. Also included is equipment acquired under pool orders issued by GSA under provisions of the Defense Production

The Commerce Department has advised the owning agencies that sponsorship of leases to "defense supporting agencies" should be governed by three basic rules:

1. The equipment is not currently available elsewhere.

The equipment is to be used to meet current production requirements.

3. The machines are to be used in "defense supporting industries," defined as "producers of items required for defense or defense production, but which are not exclusively military in their application."

The Department of Defense is also continuing its work on a surplus machine disposal policy. The objective is to speed up the screening of excess tools, and to close as far as possible certain loopholes developing in existing procedure.

Under the proposed policy, the disposal time would be cut from seventy-five to forty-five days. The procedure calls for:

1. Notification of all Services and of the Office of Defense Mobilization of the availability of a tool, its condition, and location.

 A time priority during which another branch of the owning Service could claim the tool; other priorities, in turn, to other Services, to the mobilization base, and finally, to the ODM.

3. After forty-five days with no takers, the tool could be offered for sale by the owning Service.

4. The General Services Administration would have no place in the new screening procedure. Experience has shown that notifying the Services through GSA has been expensive, and has resulted in few sales.

### **Machine Tool Buying Continues**

Despite concern about the disposal of surplus tools, DOD plans for the purchase of new machine tools remain unchanged. During the first six months of 1954, spending is at the estimated rate of \$620,000,000 for the half year. There is \$600,000,000 in funds carried over from previous years besides the \$250,000,000 which was made available in 1953 to acquire production equipment to round out the mobilization base. No part of the \$250,000,000 is to be spent this year, according to Defense Secretary Wilson, although two Services have filed applications for equipment as "needed." Included is an Air Force project which would use \$168,000,000 of the fund.



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Step Chuck Work — For rapid and accurate holding of tubing, castings, moldings, stampings and machined parts. Capacity to 6".



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The above three important requirements for proper lathe work in tool rooms, production departments, or laboratories are completely fulfilled by the new Hardinge DV59 High Speed Precision Lathe.

Correct size of the machine in relation to work saves loss from under-capacity production on larger lathes. High spindle speeds, up to 4000 r.p.m., permit full capacity cutting and excellent finish. Sustained accuracy and ease

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## Tools are the Business End of the Machine

WITHOUT cutters, grinding wheels, or punch and die sets, machine tools and metal-working presses would be as useless as an automobile without wheels. It is the "perishable tools" that enable the machine to become useful. The machine itself is merely a device, complicated though it may be, designed to feed the tools or the work at desired speeds, hold the work in predetermined locations, provide pressure to punch or shape sheet-metal parts, and perform other related functions. Tools, too, are useless without the machine. But the tools, actuated by the machine, are the final key in the production picture.

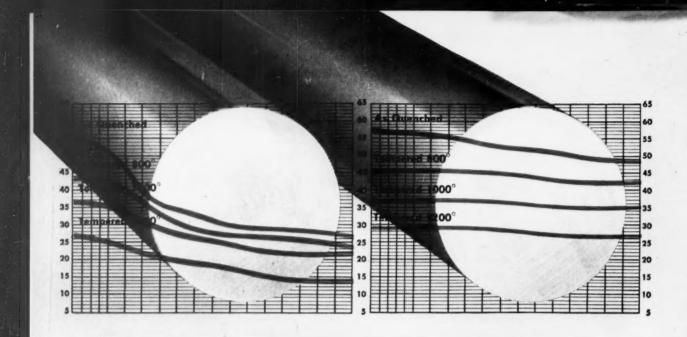
Production men and tool engineers must, therefore, keep themselves fully informed about the latest developments in cutting tools, abrasive wheels, inspection devices, work-holding fixtures, die equipment, and other adjuncts to modern metal-working machines, if they are to be truly proficient in their daily activities. The technical press constantly provides production men and tool engineers with this information, but it is desirable that they have periodic opportunities of actually seeing and handling the new things that they have been reading and hearing about.

Such an opportunity will be afforded by the 1954 Industrial Exposition of the American Society of Tool Engineers, to be held in Philadelphia April 26 to 30, inclusive. There will be approximately 500 exhibitors occupying 155,000 square feet of space. It will be the largest show since the Association began the series back in 1938. In addition to the impressive display of tooling and inspecting equipment, there will be a variety of machines on exhibition.

Lectures will be given by fifty speakers on plant management, automation, cutting, grinding, precision control, forming, assembling, and many other subjects of especial interest to engineers and shop men. There will also be a series of conferences and panel discussions relating to technological advances and the solution of production problems.

Visitors attending the Show should obtain many ideas applicable in their own shops—ideas that will improve manufacture through the adoption of advanced tooling and insure greater work accuracy and higher quality by the use of the most modern types of precision control equipment.

Charles O. Herb



## Same Alloy...but What a Difference!

Graphic Reason for Using Ryerson Certified Alloy Steel

Here are two bars of alloy steel recently purchased by a metalworking company. Both are the same type of alloy—AISI TS 4140 annealed. And both are high quality steels with chemistry meeting all the requirements of the specification.

But look at the difference revealed by hardenability tests!

The tempered-at-800° curves are typical. For the bar at left this curve starts at 44 Rockwell C and ends at 24. For the bar at right the same curve starts at 45—ends at 42. And the differences in hardenability naturally reflect equally marked differences in the mechanical properties that can be obtained from each bar.

Yet remember both bars are the same alloy and therefore are often expected to react in the same way. Their differences are only the normal variations that occur between different heats within the same specification.

That's why it is so important for you to specify and buy Ryerson Certified Alloys. Every heat of as-rolled and annealed alloy steel from Ryerson has been tested for hardenability in our own laboratory. When you receive a shipment of Ryerson alloys you also receive a Ryerson Alloy Certificate which shows exactly how your particular heat of steel responded to those tests. And the Certificate interprets the test results for you in terms of mechanical properties.

Thus you know the actual—not just the theoretical—hardenability of your alloy steel from

Ryerson. And you know exactly how to heat treat that steel to obtain the desired properties. So why guess at hardenability? Use Certified Ryerson Alloys and be sure.



PRINCIPAL PRODUCTS: CARBON, ALLOY & STAINLESS STEELS—BARS; STRUCTURALS, PLATES, SHEETS, TUBING, MACHINERY & TOOLS, ETC.

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## **Tooling for Competition**

Now that business is back on a more normal basis, manufacturing costs have again become paramount in the operation of industrial concerns. Competitive prices in the metal-working industries can be met only by using the latest manufacturing methods. The 1954 Industrial Exposition of the American Society of Tool Engineers to be held in Philadelphia from April 26 to 30 will present an opportunity of seeing hundreds of new developments of prime interest to tool engineers and production men. This number of MACHINERY both previews many of the things to be seen for the first time at the Show and features articles on cost-cutting and quality-insuring practices.

TOOL SHOW NUMBER

Vol. 60, No. 8

MACHINERY

April, 1954



## MODERNIZING a Big Job



By ROGER F. WAINDLE, President American Society of Tool Engineers E CONOMISTS making predictions for the next twelve months may not agree as to exactly what is ahead for our economy, but they do agree that competition is with us. To meet competition, costs must be kept in line and reduced if at all possible. In the challenging struggle there is little place for any product priced higher than another of similar quality. It naturally follows that the job cannot be done with yesterday's thinking, tools, or processes. Obviously, a large part of the burden of getting a company ready to meet the competitive challenge falls on the tool engineer.

The job is a big one and will take men with skill, ambition, determination, and energy to get it done. In order to attain the most effective solution at the lowest cost, the problem must be attacked in its entirety to prevent wasting time and money in random efforts that, in the aggregate, mean little to the cost of the finished product. There isn't any sense, for example, in improving a jig or a fixture for a single operation, if the better way to do the job is on an entirely different machine or if it is wiser to modify the product so that the manufacture can be different, and less costly.

Replacing a single machine with a newer model that is capable of working to closer tolerances and at a higher rate per hour is a relatively simple task. Deciding whether this replacement is the best solution or whether a different approach to the problem is the most economical in the long run requires judgment based on skill and experience.

# FOR COMPETITION for Tool Engineers

## Defining the Scope of the Problem

Understanding the role to be played by the tool engineer in meeting the competitive challenge requires definition of the word *tool*. To a tool engineer, every *tool* is simply a means to an end—whether that tool be a factory building, a machine, a milling cutter, a conveyor, or a gage. The end purpose of any tool is to manufacture a salable product at the lowest possible cost. In doing this, a tool has only one purpose: To multiply man's productive capacity per hour, per day, and per dollar.

Naturally, the tool engineer does not do the job alone. He is part of a management team along with product designing, manufacturing, purchasing, selling, and other executive personnel. It is imperative that the tool engineer be consulted on product design as well as production planning. Today's tool engineer, getting ready for tomorrow's production, must have complete knowledge of the diversity of manufacturing considerations, which includes materials, cutting tools, production machinery, and workhandling methods.

#### Progress on All Fronts

Our technology has not been standing still. New processes, machines, cutting tools, methods of transferring work between operations, and devices for controlling the accuracy of the finished product are constantly being developed. The tool engineer who is really "doing a job" for his company must keep abreast of such de-

velopments in order to utilize those that apply to the products manufactured in his plant. Tradition cannot dominate in his thinking and he cannot excuse the continuation of any operation because "We've been doing it this way for years."

There is no reason to fear that a thorough critical appraisal of manufacturing processes and productive equipment will make any company or its key personnel look bad by comparison with the rest of the industry. The need for modernization exists throughout industry in plants of all sizes. Of this fact, a survey recently conducted by the American Society of Tool Engineers bears abundant evidence.

#### Need for Modernization Clear-Cut

Obsolescence in both equipment and processes is widespread throughout plants of all sizes. Briefly, the A.S.T.E. survey showed that the companies queried believe that the percentage of obsolescence in equipment or processes is as follows: Machining, 30 per cent; automation, 28 per cent; inspection, 34 per cent; metal-forming, 28 per cent; grinding and finishing, 23 per cent; and production welding, 25 per cent.

It is important to remember that these figures represent the beliefs of the manufacturers themselves and it is reasonable to assume that the actual percentages are somewhat higher. Even if we assume that these percentages are entirely accurate, they are large enough to show that the need for modernization is widespread.

Two significant facts stand out in the survey:
(1) The largest and the smallest plants report

## MODERNIZING FOR COMPETITION

of the six categories included in the survey. process obsolescence was higher than equipment obsolescence. Let us examine these facts to see what logical conclusions can be drawn.

## Taking a Closer Look at Obsolescence

Can we assume that our largest and smallest plants are more backward than those of medium size? Such a conclusion does not bear up under close inspection. Large, inefficiently operated companies, like ancient empires, would soon decay and crumble. Small concerns, many of which exist as suppliers of sub-assemblies and components to larger companies, could not survive if they were unable to produce at a lower cost than their customers.

The answer is that the large and small companies reported a higher percentage of obsolete. equipment in the survey than the intermediate groups because they were more aware of their equipment situations. In the largest plants, there are staffs of experienced tool engineers whose primary function is to continuously study equipment obsolescence. Since the smallest plants generally specialize in certain fields, their problem of deciding what is competitively obsolete is simplified considerably.

Now let us examine the second point. In automation, inspection, and metal-forming, the survey showed that industry recognized a higher percentage of obsolescence in processes than in

the highest degree of obsolescence. (2) In three the equipment itself. What this means is that although some of the equipment itself cannot be regarded as technically obsolete, the use of that equipment has become economically unsound.

> This can be illustrated by means of an oversimplified example. Suppose a company purchases a number of the latest type of wheelbarrow to move castings from its foundry to the machine shop. The volume being produced is large enough so that a far better method would be to transfer the castings by means of a belt or trolley conveyor. The equipment being used is not obsolete, but the application of a wheelbarrow in this instance certainly is.

> Big changes under way or in the ofling will put an even higher premium on the tool engineer's know-how. To cite a paragraph from a recent issue of Automobile Facts, published by the Automobile Manufacturers Association: "Throughout the (automotive) industry, the battle lines are drawn between traditional methods of manufacture and vastly improved or entirely new methods. Departments in which processes have been essentially static for a decade or more are in ferment—and results have been in many cases no less revolutionary than those which followed the introduction of the mechanized conveyor to assembly operations in 1913."

> Changes in the automotive industry are sure to make themselves felt throughout industry in general. Certainly, automation—which is part of this change in processing—has made its presence felt far from the engine plants where it



gained early success. Furthermore, engineering talent and progress are not confined to a single plant or industry. Even the smallest plants can develop or refine techniques and equipment to have a far-reaching effect.

### Tool Engineer's Role Important

To satisfy the needs and desires of today's and tomorrow's buyers, industry must produce better and more attractive goods priced within the means of the largest possible number of prospective purchasers. It is impossible to over-emphasize the importance of the tool engineer in attaining this goal.

What makes attainment more difficult is the fact that in the battle of rising costs there is little the production engineer can do about the hourly wages paid to labor. All he can do is to minimize the effect of rising labor rates on the cost of the finished product. To do this, he must direct his efforts toward more efficient utilization of labor.

Maximum effectiveness in the utilization of labor is reached by proper integration of modern production equipment, working at its rated capacity, in the general scheme of production. Idle machines and labor will soon push any company out of the competitive picture. Inefficient handling of parts in process is another luxury that no company can afford.

Education of the tool engineer is, therefore, of paramount importance. Only by a complete

awareness of the latest developments in materials, equipment, and methods can he assist his company in effecting the modernization required to meet strenuous competition. Not only must he be aware of these new developments but he must be able to apply his knowledge to his company's specific manufacturing requirements.

A large part of this education must be obtained outside of the regular working hours, because the average tool engineer just does not have enough time on the job to learn all that is going on in related fields. Technical societies provide supplementary technical education and their facilities are being utilized by thousands of engineers. A three-way program of participation in technical society activities, attendance at industrial expositions, and study of current developments featured in the technical press is making many tool engineers more valuable members of the management team.

Aware of the major contributions that a well-informed tool engineer can make to his company's program of modernizing for competition, the A.S.T.E. has arranged for more than fifty technical sessions during the Philadelphia Convention and Exposition. These sessions will be devoted to solving the very problems that concern industry as it girds itself for the more competitive days ahead. The more than 500 exhibits of latest tooling equipment and the technical sessions will provide a great amount of valuable information to all tool engineers fortunate enough to be in attendance.



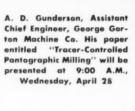


J. P. Aloisio, Applications Engineer, Research Division, Raytheen Mfg. Co., who will present a paper entitled "Ultrasonic Tools for Hardto-Machine Materials" on Wednesday, April 28

# Some of the Read Papers



C. B. DeVlieg, President, DeVlieg Machine Co. His paper entitled "New Arts in Jigless Boring" will be presented at the Convention Center Ballroom on Wednesday morning, April 28







E. M. Dowd, Executive Vice-President, Lapointe Machine Tool Co., will discuss the subject "Scanlon Employe Relations Plan at Different Production Levels" on Monday evening, April 26

D. E. Hawkinson, Vice-President, Machine Tool Sales, Greenlee Bros. & Co., who will speak on "How to Plan a Transfer Machine" at the Arena Conference Room, Tuesday afternoon, April 27





W. C. Tucker, Chief Engineer, Machine Tool Division, Buffalo Forge Co. His paper entitled "Shear-Fracture Parting of Steel Billets" will be presented at the Bellevue-Stratford Hotel April 28

F. G. Zagar, Vice-President and General Manager, Zagar Tool, Inc., who will present a paper entitled "Jig Design for Multiple Automatic Operations" at the Arena Conference Room, Tuesday, April 27





C. E. Glick, Production Engineering Manager, Tocco
Division, Ohio Crankshaft
Co., who is co-author of
a paper "High-Production
Tooling for Induction Heating" to be presented Tuesday, April 27

R. F. Helmkamp, Machine
Cutting Specialist, Air Reduction Sales Co. His paper,
under the title "FlameCutting by Electronic Tracing," will be presented
on Wednesday afternoon,
April 28



## Men Who will at the Show

J. C. Hebert, Manager of the Machine Tool Division, Jones & Lamson Machine Co., will discuss the subject "Turning Research Can Double Your Production Per Labor Hour" on Monday evening, April 26





H. Kiefaber, Gage Application Engineer, Sheffield Corporation, who will be cospeaker with W. I. Wilt on the subject "New Concepts of Gaging and Inspection," Thursday, April 29

W. I. Wilt, Assistant Manager, Sales Division, Sheffield Corporation, who will be co-speaker with H. Klefaber on the subject "New Concepts of Gaging and Inspection," Thursday afternoon, April 29





A. P. Neumann, Chief Engineer, Vapor Blast Mfg. Co., who will present a paper entitled "Surface Finish Control with Blast Cleaning" at the Arena Conference Room, Monday afternoon, April 26

P. N. Sorenson, Chief Test Engineer, Tocco Division, Ohio Crankshaft Co., who is co-author with Mr. Glick on the subject "High-Production Tooling for Induction Heating," Tuesday, April 27





E. E. Oathout, Products Engineer of Behr-Manning Corporation. His paper entitled "Abrasive-Belt Grinding of Carbide Tools" will be read at the Arena Conference Room, Wednesday, April 28

K. Drone, Chief Engineer, Hufford Machine Works, Inc., who will present a paper entitled "Principles of Stretch Wrap Forming" at the Philadelphia Convention Center on Friday afternoon, April 30

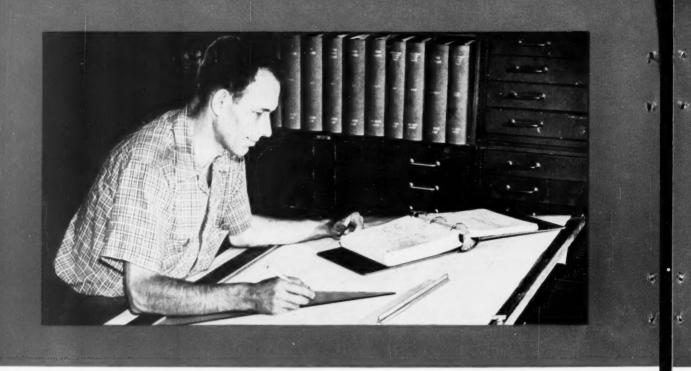




J. W. Rapp, Superintendent of Gear Manufacturing, Ohio Axle and Gear Division, Rockwell Spring & Axle Co., who will speak on "Hobbing at High Speeds and Heavy Metal Removal," Wednesday, April 28

R. S. Segsworth, Director of Research, General Engineering Co., Ltd., who will present a paper under the title "Process Applications for Dual-Frequency Induction Heating," Tuesday, April 27





MAJOR objective of any progressive manufacturer, especially in present-day competitive markets, should be to lower costs. An effective method of accomplishing this objective is to reduce waste in manufacturing. At the Ford Motor Co., waste has been greatly reduced, substantial savings are being realized, and numerous other benefits are being derived as the result of a comprehensive standardization program that delves into every phase of manufacturing, including processes, materials, tools, industrial equipment, and methods.

## Purposes of Manufacturing Standards

The first Ford manufacturing standards were published during 1920 in the form of booklets containing 6 1 2- by 10-inch blueprints. These early standards dealt only with such general subjects as recommended methods of dimensioning drawings, reference tables, and tolerances for manufacturing practices.

A new series of standards was initiated in 1935, replacing the early ones. They included Tool, Press-Room, and Drafting Standards, and consisted of approximately 300 pages. While adequate at the time, technical progress demanded more extensive standards and made the need for a change in Ford's standardization program even more desirable.

Realizing this urgent need, D. J. Davis, Director of the Office of Manufacturing Engineering, conceived the present standardization program and work was begun on it in 1950. Since then, considerable money and tremendous effort have been expended to make the standards the most comprehensive in the industry. The primary purposes in establishing the Ford Manufacturing Standards are:

- 1. To promote uniform performance of tools, equipment, materials, and processes, and obtain maximum usefulness from them.
- 2. To serve as a guide in the establishment of new facilities.
- 3. To reduce inventory variety, volume, and space requirements. Less variety permits quantity buying with its advantages of lower costs and multiple sources of supply.
  - 4. To promote safety.
- 5. To increase the availability of tools, equipment, and materials.
- 6. To promote interchangeability, thus minimizing "down" time in changing the tools on machines.

Judicious application of the standards has also reduced the need for special, non-standard tools and equipment, and related design time. The standards are of considerable aid to tool engineers and designers since they do not have to scan numerous catalogues, and are sure of se-

# FORD BENEFITS BY TOOL STANDARDIZATION

An extensive standardization program encompassing every phase of tooling and processes for manufacturing is being developed by the Ford Motor Co. The program has reached the stage where its many benefits are becoming extremely impressive

By CHARLES H. WICK

lecting the best tool for the job. Designers at the Ford Motor Co., such as the man shown in the heading illustration, refer frequently to the newly published tool standards book while designing a new piece of equipment. Other manufacturing standards books, seen in the background, are within easy reach of the designer. Specification of standard tools, equipment, and materials minimizes the negotiating time required for inquiries, purchase orders, and design approvals. Another benefit is that common language with standard terminology is established among designers, buyers, and suppliers.

Ford Manufacturing Standards were developed after an exhaustive survey of all processes, materials, equipment, and tools to determine what standards were necessary. All existing drawings and specifications were reviewed, the past performances of tools and equipment studied, and the results of tests analyzed and evaluated. A description of the comprehensive tool analysis, research, and testing program conducted at Ford was described in April, 1950, MACHINERY, pages 189-193.

Next, tests of competitive cutting tools were carried out in regular production on standard machines and work-pieces, and data were summarized on standard tool performance and cost analysis forms. Specialists in various fields were solicited for their viewpoints and suggestions.

and the manuals and catalogues of suppliers were screened.

Although most of the standards developed to date are original—being the result of research and testing by company activities—full consideration has been given to standards already established and a number of them have been adopted. Commercial items have been adopted as standards whenever practicable to insure minimum cost and availability. However, the final choice for a standard is based on over-all economy rather than initial cost of the item. As the need is demonstrated, standards are reviewed, revised, and supplemented, or classified obsolete.

#### Company-Wide and Supplier Participation

All divisions of the company participate in the development, approval, and revision of the standards through their representatives on the various Manufacturing Standards sub-committees. These representatives are the best-informed technical men available in the particular fields to which the sub-committees are devoted. Among the many sub-committees that have been established are those assigned to standards on tools, gages, electrical equipment, lubricants, hydraulic equipment, welding, automation, industrial equipment, conveyors, abrasives, press-room equip-

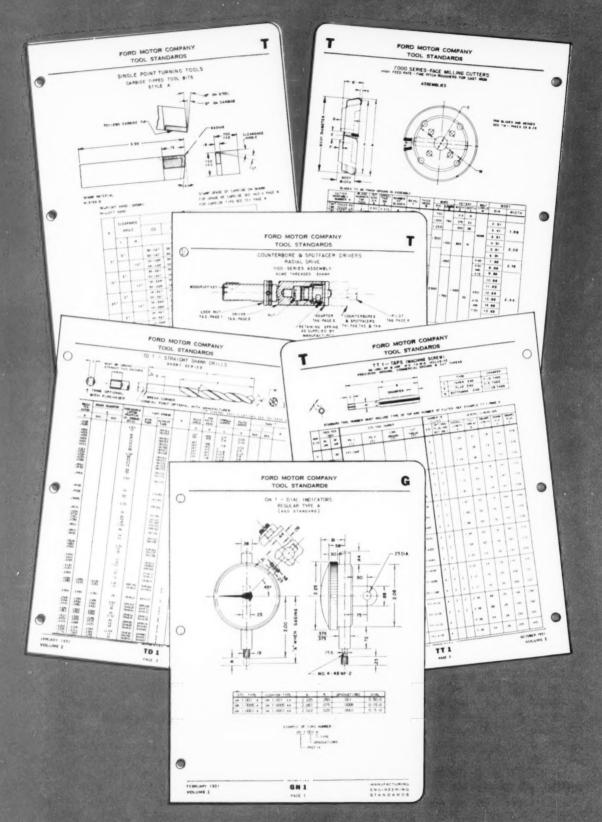


Fig. 1. Typical pages from the Ford Manufacturing Standards for Tools show comprehensive information included with each standard.

Fig. 2. Variety of face-milling cutters required has been reduced from seven types to three types by the standardization program.

ment, materials handling, drafting standards, and chemical processing.

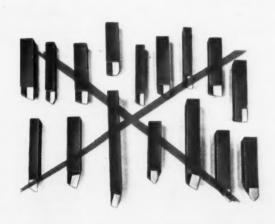
The Ford Manufacturing Standards are printed on 8 1/2- by 11-inch paper and issued in looseleaf binders. They have been divided into five books: Tools (Vols. I and II); Processes; Materials (Vols. I and II); Methods and Specifications; and Industrial Equipment Standards. The books are available for use by activities of the Ford Motor Co. and its suppliers. A nominal charge is made for subscription to the books in order to limit indiscriminate and ineffectual cir-

culation. The subscription price includes revisions and new additions for one year.

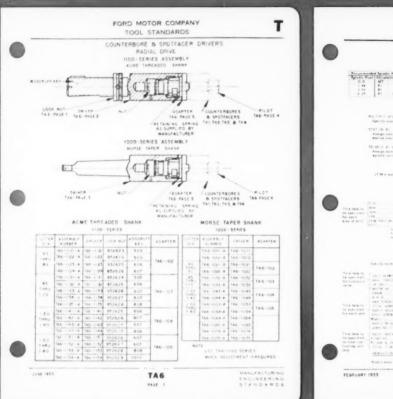
Besides these standards books, related material has been selected from the large volumes and published as individual section books for the benefit of those individuals who specialize in particular phases of manufacturing and tooling. Subjects of the various section books are: tools, dies, welding, industrial process equipment, materials handling, abrasives and supplies, and material processes and drafting standards.

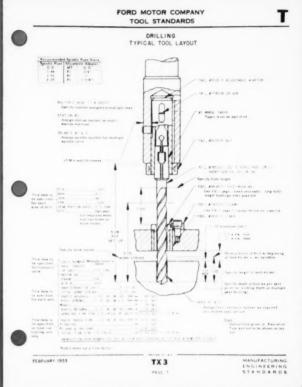
Those standards most necessary have been

Fig. 3. Sixteen single-point, carbide-tipped tools have been replaced by the standard holder with solid-carbide triangular insert here shown.









Pig. 4

developed first. Even though the present seven volumes of standards and seven section books are voluminous, it is felt that only the essential subjects have been covered. Drawings and standards have been carefully prepared to make each standard comprehensive and informative. Typical pages from the Ford Manufacturing Standards for cutting tools are shown in Fig. 1.

Included in the two volumes on tools are standards on abrasives, press-room equipment, fixtures, gages, holders and drivers, turning tools, cut-off blades, drills, milling cutters, reamers, taps, hacksaw blades, hammers, wrench sockets, and welding equipment.

### Specific Benefits Derived from Standardization

An example of the important benefits that have already been realized from the standardization program is the reduction in the variety of

face-milling cutters employed. Previously, seven (or more) types of face-milling cutters, seen at top in Fig. 2, were purchased, stocked, and used. Now, the same requirements are being met with three types of cutters, shown at the bottom. Since each cutter type has its own blade requirements, the variety of blades that must be carried in stock is greatly reduced. Also inspection, sharpening, and maintenance procedures are simplified.

One standardized cut-off blade for automatics has replaced at least six blades used previously. Four styles of single-point, carbide-tipped turning tools and one style of tool-holder for round, triangular, and square solid-carbide inserts have now been standardized for the majority of turning applications. Very few special turning tools have been necessary since the standards were developed. Insert type carbide tools are employed for turning wherever possible, because they are more economical. The standard holder seen at

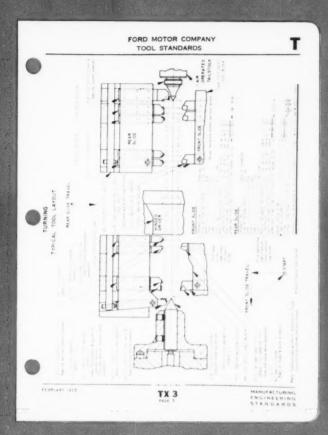


Fig. 4. Counterbores and spotfacers have driver, adapter, cutting tool, and pilot made as separate pieces so that only the tool has to be discarded.

Fig. 5. Typical tool lay-out for drilling promotes the use of standard drills and related tools such as drivers, adapters, hushings, and liners.

Fig. 6. In designing a turning set-up, the engineer follows this typical tool lay-out. Sperial tools carry a "Z" number, while all other turning tools are standard.

Fig. 6

the right in Fig. 3, with a solid-carbide triangular insert having six cutting edges, replaces the sixteen single-point, carbide-tipped tools shown.

6

Straight-shank, tang drive twist drills have been standardized in two series—short and long. Taper shank twist drills have also been standardized, but they are only employed for special applications where straight shank drills would be unsatisfactory. Core-drills with replaceable cutter tips have been made standard. Fixture bushings have been standardized in two classes—the selection of either class depending on whether the bushings will be subjected to normal or severe wear.

Extensive use of carbide is specified for the standard cutting tools. In addition to the carbide inserts and tipped tools for turning, carbide-tipped reamers (as well as high-speed steel reamers), counterbores, spot-facers, and milling cutters are standard.

Included in the tap standards are suggestions as to the type of tap—precision ground, commercial ground, or cut thread—to be used for securing various class fits. Also included are a considerable number of pages giving standard tap nomenclature, and recommended cutting face angles, speeds, and coolants for tapping various materials.

Substantial savings have been obtained by standardizing on radial drive, counterbore and spot-facer drivers, Fig. 4. Considerable time used to be spent in changing spot-facers and counterbores, it being necessary to unscrew the pilot from the holder in the spindle assembly to remove the dull tool. Even when a quick-change feature was adopted, there was still considerable waste because it was necessary to discard the entire tool. Now, with the standardized driver (available with either Acme threaded or taper shank), adapter, cutting tool, and pilot made as separate pieces, it is possible to discard only the

worn-out tool, retaining the driver, adapter, and pilot for further use.

To achieve maximum effectiveness, standard tools should be thought about and applied in the early stages of program planning and design development. Each individual who is responsible for the selection and application of tools has been instructed to apply Ford Manufacturing Standards. Before standardization, it was not uncommon for various divisions of the company to procure a wide variety of similar commercial tools, and many special tools were unnecessarily designed. Now, the variety of tools required has been greatly reduced, and special tools are never specified if it is possible to buy a standard or commercial tool that will adequately do the job. When standard or commercial tools are no longer required for a particular job, they can be returned to stock for future use. Special tools, however, must either remain on the shelf in inventory or else be scrapped.

#### Tool Lay-Outs Promote Use of Standard Tools

Typical tool lay-outs—such as the one shown for drilling in Fig. 5—are provided in the books to promote the use of standard tools. When the designer follows this recommended procedure, the drawing and specification of standard drills and related tools (adapters, drivers, nuts, bushings, clamps, and liners) are facilitated, since

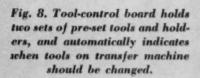
the standards are listed on the typical tool layout. Also, the lay-out helps to reduce the time required to set up and change tools on the machine by establishing dimensions (such as work stroke, feed stroke, and index time) for presetting the tools. Before such a system was followed, special length drills and non-standard accessories were frequently specified. Since the yearly consumption of drills is very high, the small saving resulting from the use of each standard drill is rapidly multiplied into a tremendous saving each year.

A typical tool lay-out to be followed for turning operations is illustrated in Fig. 6. In this and the preceding drawing, special tools required carry a "Z" number. All other holders, inserts, blocks, and tips are standard. The degree to which tool standardization has been applied in actual production is exemplified by the Greenlee four-way, multiple-spindle tapping machine as seen in Fig. 7. Sixty-one of the sixty-six taps employed on this machine are standard. This machine simultaneously taps holes in four surfaces on cylinder blocks for Lincoln overhead-valve, V-8 engines.

In conjunction with the standardization program, much effort is being given to the establishment of the most suitable feeds and speeds for various machining operations. When they have been developed, they too will be issued as standards. Also, schedules are being established, based on optimum wear points, to control the removal



Fig. 7. Sixty-one of the sixty-six taps employed on this four-way, multiple-spindle machine are standard. Work-piece is engine cylinder block.





of cutting tools from machines after a definite period of operation. Previously, cutting tools were changed at the discretion of the operator, either at random or after scrap pieces had been produced. It has been found that the rate of wear rapidly increases when the tools are operated after producing a certain number of work-pieces. Allowing the tools to wear excessively before sharpening shortens their life, thus increasing tool costs. Higher quality, more uniform parts, and less scrap are direct advantages.

## Control Boards Reduce "Down" Time in Changing Tools'

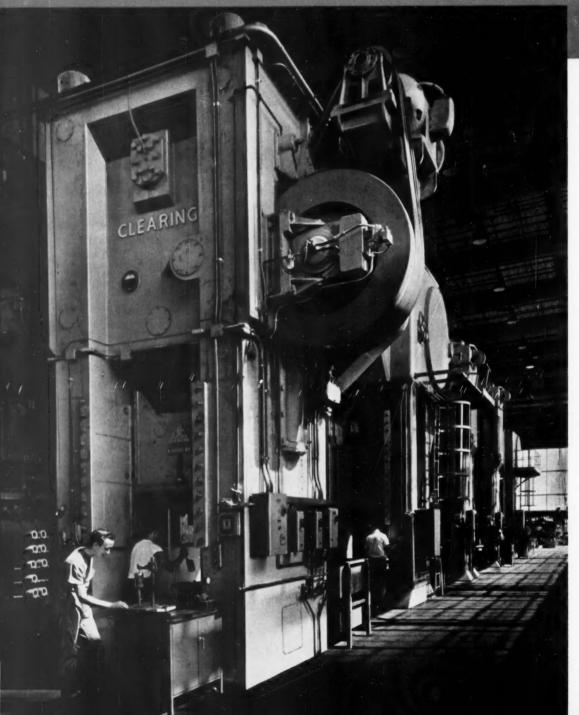
An improvement introduced on the new overhead-valve engine production lines to help maintain controlled tool change cycles is the use of tool-control boards, such as the one shown in Fig. 8. These boards hold two sets of pre-set tools and holders, to minimize the "down" time necessary for changing tools. Toolometers, which are pre-set counting dials equipped with signal lights, automatically keep track of the number of parts produced by various tools on multiple-station transfer machines, and warn the operator when a particular tool should be changed.

Proper tool grinding practices are another phase of the standardization program, and recommended procedures will be published as standards as soon as they are developed. An attempt is made to inspect all tools prior to sharpening to show possible abuses such as excessively long operation, bumping, or possibly faulty machine operation. Also, the amount of stock to be ground from the tool during sharpening is specified whenever possible. Handling and storage of the tools are important factors, and standard containers and protective coatings are being developed to meet the need.

Careful attention must be paid to the design, material, and finish of tools used in the cold-extrusion process. Although experimental work may often be needed, some general information of fundamental importance can be presented

HEAVY-COLD

Photo, courtesy of Heintz Mig. Co.



# DUTY TOOLING FOR EXTRUSION OF STEEL

OLD extrusion of steel—or plastic deformation caused by the application of compression loads—demands the use of heavy-duty equipment. Although originating in Germany during World War II, the process has undergone considerable development there and in other countries. This development has been primarily in the field of ordnance, but is now finding widespread acceptance in commercial industry. An example of this is the battery of extrusion presses shown in the heading illustration.

Operating problems are more difficult to overcome in the cold extrusion of ferrous metals than in the handling of non-ferrous metals. This is due mainly to the heavy pressures involved which necessitate the use of high-tonnage equipment, die materials capable of withstanding the high stresses imposed, and lubricants that will stand up under the heat generated during the operation.

An interesting series of cold-extrusion operations as employed in the production of 105-millimeter howitzer shells is shown in Fig. 1. The tool for the final forward extrusion operation may be seen at the right in the illustration. Four extrusion stages in closed dies, followed by a full spheroidizing heat-treatment, preceded the final operation. The ratings of the presses used were calculated on the basis of the full projected area for the first two operations; the punch areas for the next two; and the cross-sectioned area of the cup wall for the forward extrusion stage. Allowance must be made for the effect of work-hardening and restriction to the flow of metal.

#### Basic Extrusion Die Design

Three tools demonstrating the fundamentals of extrusion die design are illustrated in Fig. 2. A closed die, shown at (a), is used for sizing the

blank after it has been parted from bar stock. At (b) can be seen a backward extrusion die in which the metal is forced to flow in a direction opposite to that in which the punch travels. A typical forward extrusion die is shown at (c) in which the flow of metal is in the same direction as the movement of the punch. Carbide inserts are employed in all three tools, each insert being mounted in a thick-walled steel ring. This ring is located in the tapered bore of a heavily proportioned holder consisting of two members shrunk together. A cup is shown being removed from a backward extrusion die in Fig. 3.

Two inserts are fitted to the forward extrusion tool—one to form the metal as it flows past the punch, and the other to guide and control the straightness of the work-piece. The distance moved by the bottom of the shell in comparison to the travel of the punch may be noted. Heavy screws are required to secure the tapered die members. Substantial pre-stressing is essential to minimize expansion of the members and resultant failure of the carbide ring under the extremely high pressures to which they are subjected. These pressures are often in the neighborhood of 300,000 pounds per square inch.

Tough steel plates are placed between the punch and die members and also between the top and bottom platens of the press for the purpose of distributing the heavy local loads. To alleviate the tendency of the punch to scuff the highly polished surface of the die ring, the punch should be slightly reduced in diameter above the die orifice. It is also recommended that the area of the die subjected to expansive extrusion forces should be located high in the supporting structure so that the ring will not "dish" under load.

Punch and die components of a tool designed for the backward extrusion of a steel cup are shown in Fig. 4. An angle of 1 or 2 degrees on

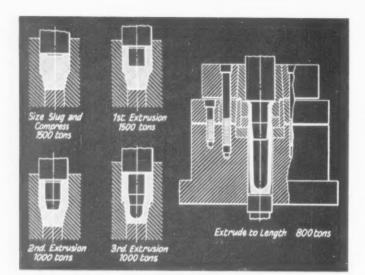


Fig. 1. Consecutive operations in the cold extrusion of 105millimeter shells are shown with their required pressures.

each side of the die serves to secure it in the supporting ring. Three step diameters are machined in the bore of the die: D to provide a lead-in,  $D_1$  to locate the blank, and  $D_2$  to control the size of the extrusion.

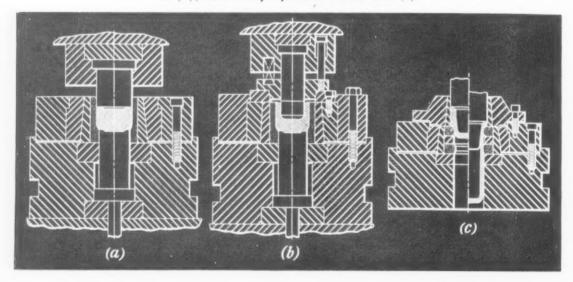
A large nut and a tapered bushing secure the punch in its holder. The conical bottom face of the punch has an angle  $\Theta$  of 5 to 7 degrees and a radius of 0.020 to 0.040 inch on its leading edge. A 0.004- to 0.008-inch deep relief is machined on the punch to form a land 1/8 to 1/4 inch wide.

Dies designed for the forward extrusion of preformed cups, Fig. 5, should be provided with a pair of 1/4- to 5/16-inch wide forming lands,

the lower land being about 0.004 inch larger than the forming diameter. Another guiding member A is included to insure straightness of the work-piece. Below the punch B is fitted an extrusion cone C which makes the first contact with the slug and controls the internal diameter of the work-piece. It is recommended that a clearance of 0.004 to 0.008 inch be allowed between the extrusion cone and the internal diameter of the preformed cup from which the finished part is produced.

One point in the design of forward extrusion dies, which has a marked effect on extrusion pressures and final hardness of the part, is the angle of the conical shoulder at the upper end of

Fig. 2. Typical extrusion tools incorporating cemented-carbide die members. A sizing tool is shown at (a), a backward extrusion tool at (b), and a tool for forward extrusion at (c).



the forming diameter. The angle may vary from 90 to 126 degrees, but should have a radius of 0.020 inch at its intersection with the parallel walls of the die opening. The effects of the various angles on the extrusion pressure and also on the impact strength and hardness of different steels are shown in Fig. 6. Impact strength values were obtained by the DVM test, which is used extensively in Great Britain. It is comparable to the Charpy system of testing. Steels represented in this illustration are identified as to chemical composition and mechanical properties in Table 1.

### Die Steels for Cold Extrusion

The materials used in the manufacture of coldextrusion tools have been the subject of considerable development. A recommended material for dies is a water-hardening tool steel containing 1.1 per cent carbon, 0.3 per cent chromium, 0.35 per cent manganese, and 0.1 per cent vanadium. An oil-hardening steel suitable for use in punches contains 0.55 per cent carbon, 1.5 per cent chromium, 4.5 per cent nickel, 0.9 per cent tungsten, 0.3 per cent silicon, and 0.4 per cent manganese. The dies should be hardened from 58 to 60 Rockwell C, and the punches between 60 and 62 Rockwell C. Although greater hardness may be desirable from the point of view of wear resistance, the fluctuating stresses to which the tools are subjected leads to fatigue. Therefore, adequate toughness must be assured. The presence of tungsten in the punch material is beneficial in preventing softening of the member. which reaches a temperature ranging from 200 to 300 degrees C. during extrusion operations.

Forged tool steels should be used. Large dies and punches requiring a pronounced change of section should be pre-forged. During the hardening of the dies, it has been found advantageous to direct a high-pressure jet of water against the extrusion shoulder.

Particular attention should be paid to the surface finish of the tools, since an extruded part will have the same smoothness as the die in which it was produced. A surface finish of 100 micro-inches r.m.s., or less, can consistently be obtained. Lapping has proved to be very successful, although grinding or polishing operations may be performed. Whichever method is used, it should follow the direction of material flow.

The compositions of die steels considered suitable for cold extrusion are listed in Table 2; their heat-treatment characteristics in Table 3.

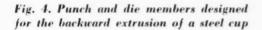
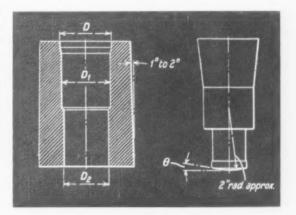




Fig. 3. Backward extruded cup being removed from cold-extrusion die in a Heintz operation. Note rugged construction of punch and die.

Steel No. 1 is relatively inexpensive, but must be quenched rapidly to produce a martensitic structure. Although only a shallow hardened skin is produced, the core has a useful degree of toughness. The ease with which hardening can be accomplished increases progressively from steels Nos. 2 to 8. No. 8 is of the oil-quenching,



Steel No.	Туре	Nominal composition—per cent						
	.,,,,	С	Mn	Ni	Cr	Mo	٧	w
1	f per cent carbon	1.1	0.25		_	Average	more.	-
2	I per cent carbon-vanadium	1.0	0.3	-	-	100.00	0.2	-
3	14 tungsten	1.25	0.3	E0-00	0.3	-	name.	1.3
4	54 tungsten	1.6	0.3		0.6		*****	5.5
5	5 tungsten-vanadium	1.6	0.3	ennik.	0.6		1.0	5.5
6	High-carbon chromium	1.0	0.4	0.000	1,45	97-19	-	-
7	High-carbon chromium	1.0	0.7	-	1.45		-	-
8	14 tungsten-chromium	0.9	0.9		1.15	or profess		1.5
9	13 manganese	0.9	1.85	Beside	0.45		Rece	0.4
10	1 manganese	0.9	1.25	-	0.45		0000	0.4
11	64 chrome-molybdenum	1.0	0.35	perce	6.25	1.0	-	-
12	High-carbon, high-chromium	2.3	0.35	-	13.0			-
13	High-carbon, high-chromium	1.65	0.45	NOTICE .	13.0	0.7	0,3	10.0
10 11 12 13 14 15	18/4/1 high speed	0.75		nerve.	4.25	termin.	1.4	18.0
15	14/4/4 high speed	1.2			4.5	-	3.8	13.5
16	4½ nickel-chromium-molybdenum, carburizing	0.15	0.5	4.25	1.3	0.3	and .	-

Steel No.	Hardening temperature, deg. C.	Quenching medium	Tempering temperature, deg. C.	Typical hardness, Rc	Ac <sub>1</sub> temperature, deg. C.	M <sub>g</sub> temperature, deg. C.	Hardenability evaluation	Abrasion resistance evaluation
1 2 3 4 4 5 6 7 8 9 10 11 12 13 14 15 16	780 790 800 820 820 820 840 820 790 780 979 970 1,020 1,300 1,280	W or B W W W W W O O O O O o or A O o or A	180 200 200 200 200 200 200 200 200 200 2	62/64 62/64 62/64 61/63 61/63 62/64 62/64 62/64 62/64 62/65 61/55 61/55 62/65	720 720 740 740 740 730 730 730 730 710 720 780 800 790 810 810	220 220 180 200 200 200 200 200 170 190 220 190 200 220 180 350	Shallow Shallow Shallow Medium Medium Medium Medium Medium Medium Deep Deep Deep Very Geep Deep Deep Deep	Low Low Medium Medium Low Low Low Low Low Low Low Low Yery high Yery high Yery high Yery high Low to medium

Steel No.	Heat-treatmen	Tons per sq. in at fracture	
1 1 7	W.Q. 770	T. 150	212
	W.Q. 770	T. 150	212
	O.Q. 840	T. 150	220
7	O.Q. 840	T. 150	221
8	O.Q. 820	T. 150	200
9	O.Q. 820	T. 150	196
9	O.Q. 790	T. 150	191
9	O.Q. 790	T. 225	163
10	O.Q. 790	T. 225	215
11	O.Q. 970	T. 150	198
	O.Q. 970	T. 150	218
	O.Q. 1.020	T. 150	186
13	O.Q. 1,020	T. 150	194

W.Q. - Water Quench.

Table 1. Compositions and physical properties of steels suitable for the cold-extrusion process

Table 2. Die steels used in coldextruding ferrous metals

Table 3. Heat-treatment characteristics of the sixteen die steels listed in Table 2

Table 4. Compression test data for some of the steels listed in Table 2

Fig. 5. A forward extrusion tool in which an additional guiding member (A) is incorporated to insure straightness of the work-piece.

non-deforming type. Deeper hardening is possible with steels Nos. 9 and 10. Air-hardening in small sections is possible with steel No. 11. Moreover, this alloy has a high abrasion resistance and is fairly tough.

The abrasion resistance of steel No. 12 is very high but its shock resistance is poor; it is difficult to machine and grind. Steel 13 is considered to be more satisfactory in all respects. Steels 14 and 15 are of the tungsten high-speed type and are very satisfactory for cold-extrusion dies due to their resistance to softening at elevated temperatures. Since extrusions often leave the press at temperatures up to 300 degrees C., it is safe to assume that the tools must frequently reach a temperature considerably above this figure. A carburized case of 56 Rockwell C hardness together with a tough core is obtainable with steel No. 16. This steel is, however, the most expensive of the group.

All steels used for cold-extrusion tools should be of the highest quality and their heat-treatment accurately controlled. Martempering can frequently be employed to advantage. Surface treatments such as nitriding and chromium-plating have been used with a marked improvement in wear resistance.

Generally, die steels suitable for cold-working operations should be resilient rather than tough. Compression test data for some of the steels under discussion are listed in Table 4. The specimens tested were 3/4 inch long and 3/8 inch in diameter. Higher values, up to 280 tons, per square inch, can be obtained with some high-speed steels.

#### Presses for Cold-Extrusion Operations

Both hydraulic and mechanical presses have been employed satisfactorily in the cold extrusion of steel. Very high pressures are required from these machines. To induce plastic flow in a steel slug, pressures in the region of 350,000 pounds per square inch may be needed. The pressure at the start of the extrusion operation might be as much as 30 per cent higher than that required to maintain the flow of metal. If the speed of the punch is excessively high, a correspondingly high peak load might be developed; if the ram speed is too low, the punch might hesitate as it strikes the slug. It is very likely

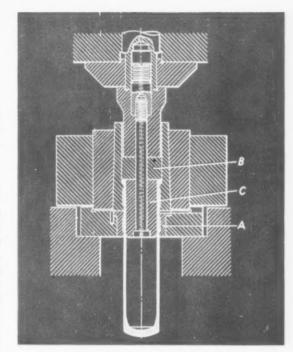
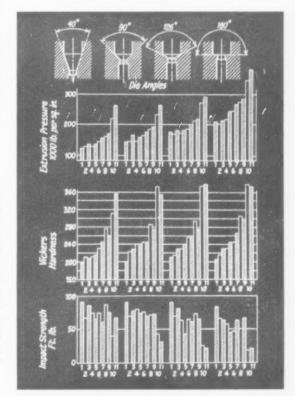
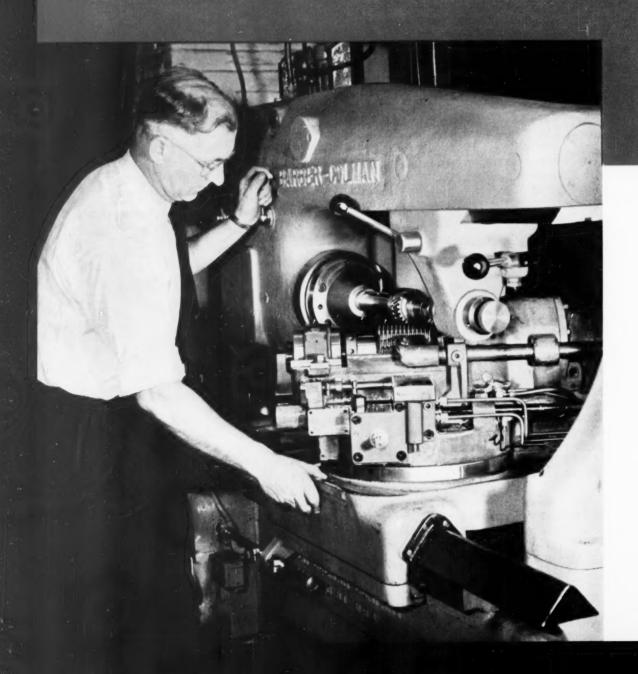


Fig. 6. Diagrammatic representation denoting influence of the die angle on the various steels outlined in Table 1



(Continued on page 237)

# HIGH-SPEED HOBBING RESULTS IN IMPORTANT SAVINGS



Remarkable reductions in production time are being achieved by increasing hobbing speeds. In many instances, hob life is lengthened, and where subsequent finishing of the gear teeth is required, feed rates used in hobbing can also be boosted to expedite the operation

PECTACULAR results obtained in increasing the production of hobbed gears at the Allison Division, General Motors Corporation, by boosting the speeds and feeds employed for hobbing were described in an article published in December, 1952, MACHINERY, page 151, Production increases up to 200 per cent, and lengthening of hob life by as much as 100 per cent were experienced in this plant.

Since hobbing is such an important operation in the metal-working industry, the publication of these results created tremendous interest among users and makers of hobbing machines both in this country and abroad. Many companies have conducted tests in attempts to duplicate, and, if possible, improve upon the performances reported. The results of some of these tests will be described in this article.

One large user of hobbing machines has been able to reduce the time for cutting a certain gear from 16 to 4 1/2 minutes by increasing the speed from 80 to 275 feet per minute, the feed remaining unchanged. In another instance, the time for cutting a gear has been reduced from 8.2 to 2.12 minutes by increasing the speed from 117 to 196 feet per minute, and the feed from 0.04 to 0.10 inch per revolution. In the latter case, hob life between regrinds has been increased despite the increased speed and feed employed.

Many hobbing machines now in use do not provide spindle speeds that will permit the high hobbing speeds reported or visualized, nor are they necessarily powered or designed to operate for long periods under the loading conditions of rapid gear cutting. Certain machines have, however, been modified or designed to take advantage of high-speed hobbing, and others are under development.

For example, a high-speed gear-hobbing machine, recently introduced by the Michigan Tool Co., permits hob speeds up to 1000 R.P.M. or more—corresponding to a cutting speed of 1300 surface feet per minute or more with a 5-inch diameter hob. One set-up on this gear hobber is illustrated in Fig. 1. In this operation, two 3 1/8-inch diameter, 9 pitch (2-inch face width) gears are finish-cut simultaneously to well within preshave tolerances. High-speed steel hobs are used,

and the two gears are finished in a cutting cycle of 58 seconds.

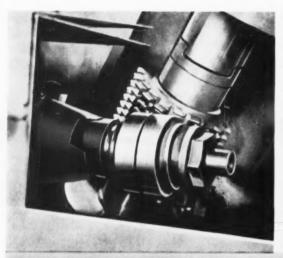
In a test run of high-speed hobbing conducted by the Barber-Colman Co., good results were obtained on one of its machines, seen in the heading illustration, with a hob speed of 307 surface feet per minute and feed rates of both 0.040 and 0.070 inch per revolution. The helical, automotive transmission gears were hobbed from S A E 5135 steel having a Brinell hardness between 170 and 207. Each gear had 22 teeth of 9 diametral pitch, with a face width of 13/16 inch and a dimension over two pins between 3.1719 and 3.1669 inches.

A high-speed steel, triple-thread, unground hob of Class C accuracy was employed for this test. The hob, of 9 diametral pitch and 18 1/2-degree pressure angle, was 5 inches in diameter and 5 inches wide. Johnson's Wax Cut No. 120 was used as a coolant. Estimated hob life was 150 to 200 pieces per sharpening for both feed rates, based upon 0.015-inch stock removal per sharpening. Although this was only a test, it was felt that the results could be duplicated on a production basis, depending upon the finish that was required.

Considerable experimental work with highspeed hobbing has been carried out by Vauxhall Motors, Ltd., Luton, England. So successful were these experiments that greatly increased cutting speeds have now been adopted in connection with a number of the gears used in automobiles made by the company. Some further investigation, with the object of extending the applications of high-speed hobbing, is now in progress.

Single-start hobs are employed for cutting the majority of the gears made under conventional conditions, especially for the lighter duty gears that are finish-hobbed in one operation. To insure accuracy of tooth form, a shaving operation is carried out on heavier duty gears so that a certain latitude is permissible at the hobbing stage. Gears cut by high-speed hobbing methods must be of the same quality as those obtained by conventional methods, and all the experiments were carried out on production line machines without adversely affecting the rate of output.

All the gears produced by this company must be within 0.0005 inch of the nominal dimensions,



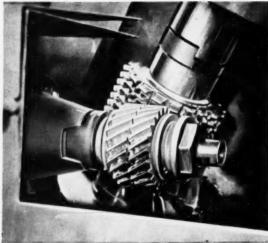


Fig. 1. Two 3 1/8-inch diameter, 9-pitch gears, having a 2-inch face width, are hobbed simultaneously in a 58-second cutting cycle. (Left) Just before the button is pushed to start the cycle. (Right) Hobbing has been completed, and the hob and tailstock center have retracted.

and the same limit is maintained on lead errors. On shaved gears, the profiles must be held within 0.00075 inch of the true involute forms, and gears produced by high-speed hobbing methods are usually subjected to a more critical inspection than those hobbed at the customary speeds.

#### Cutting Time Reduced from 16 to 4 1/2 Minutes

One of the first components on which experiments were carried out was the mainshaft first and reverse gear. Two components are hobbed together in this operation. The gears have 22 teeth of 8/16 diametral pitch and are made from 1 per cent chromium steel bar annealed to a hardness of 156 to 207 Brinell. The outside diameter of the gears is 2.875 inches. The teeth are 2 1/2 inches long, and have a 30-degree pressure angle and a depth of 0.123 inch.

As when hobbing at normal speeds, a standard, single-start, ground-form, high-speed steel production hob is employed which measures 3 inches in diameter by 3 inches long. Before high-speed hobbing was introduced, the hob was run at 102 R.P.M., giving a cutting speed of 80 feet per minute, and the feed per revolution of the work was 0.040 inch. Conventional up-cut methods were employed, the gears being finish-hobbed in one pass. The cutter life between regrinds was 90 gears.

Several different cutting speeds were tried on this machine by fitting special pulleys to enable the higher speeds to be obtained. It was found that the number of components hobbed between regrinds was considerably reduced as the cutting speed was increased—until the number began to rise again, at about 180 feet per minute. At 275 feet per minute, which required a hob speed of 350 R.P.M., the number hobbed between regrinds had risen to 70. The feed was maintained at 0.040 inch per revolution, since the gears were required to have a good finish and it was thought that higher feeds might adversely affect the tooth surfaces.

As with the other high-speed hobbing set-ups to be described, the climb-cutting arrangement is such that the cutting pressure acts against the arbor support center. Thus it is insured that any play in the work-table bearings will not affect the accuracy of the gears produced. With the set-up described, the time required to cut one gear was reduced from 16 to 4 1/2 minutes. The number of machines engaged on this particular component has been reduced in the same ratio, and other costs have also been lowered appreciably.

#### Four Hobbing Machines Required Instead of Nine

Another somewhat similar component, the second and third speed sliding gear for a passenger car, was the subject of early experiments and the set-up now employed for high-speed hobbing is illustrated in Fig. 2 (a second component

being seen in another position in the upper left-hand corner). This sleeve has 29 external helical teeth of 12 diametral pitch and a depth of 0.067 inch. The diameter is 2.56 inches and the tooth length is 2 13/16 inches. Made from a 0.4 per cent carbon steel, having a tensile strength of 70,000 to 80,000 pounds per square inch, the blank has a hardness of 152 to 207 Brinell.

A single-start, form-ground hob, 3 inches in diameter by 3 inches long, was employed for both conventional and high-speed hobbing. Originally, the hob speed was 102 R.P.M. (80 feet per minute) and a feed of 0.040 inch per revolution was employed, enabling 80 gears to be cut per regrind. Two higher speeds were tried-260 and 296 feet per minute. Cutting time was thus reduced from 19 minutes to 8 1/2 and 7 1/2 minutes, respectively. In this instance, it was found that the higher speed considerably reduced the hob life, which was 60 pieces at 260 feet per minute and only 50 pieces at 296 feet per minute. The former speed, with a feed of 0.040 inch per revolution has now been adopted for this component.

With this set-up, again, the cutting pressure acts against the arbor support center, and climb-hobbing is employed. Power consumption was found to be 0.75 H.P. at 80 feet per minute and 1.6 H.P. at 260 feet per minute. So satisfactory were the results achieved that the number of machines engaged on this particular component has been reduced from nine to four without any reduction in the number of parts produced.

#### Aluminum Gears Hobbed at 410 Feet per Minute

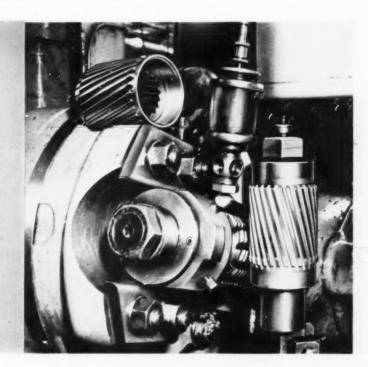
The aluminum camshaft driving gear to be considered next has a diameter of 6.994 inches; and the 62 helical teeth, which are 15/16 inch long, 8 diametral pitch, are cut to a depth of 0.235 inch. Two gears are cut at a time. Originally with a 3 1/8-inch diameter hob and a cutting speed of 222 feet per minute, the two gears were cut in 20 minutes at a feed of 0.040 inch per revolution, using paraffin as a cutting fluid. One hundred gears were produced between regrinds, during which 0.015 to 0.020 inch of cutter material was removed.

The cutting speed was increased to 410 feet per minute with a feed of 0.053 inch per revolution, and the time for two gears was reduced to 7.2 minutes. The new set-up, in which the gear is climb-hobbed with the main pressure exerted downward against the table bearings, is seen in Fig. 3. With this speed and feed, the number of components hobbed before a similar amount of metal must be removed from the cutter in regrinding has risen to 180. The automatic hob shift device is not used and the hob is moved to four different positions as it becomes blunted.

#### Hob Life Doubled with High-Speed Hobbing

The last two examples of high-speed hobbing at this plant are gears that are finished by a subsequent shaving operation, so that a certain

Fig. 2. Set-up used for hobbing a second and third speed sliding gear with a cutting speed of 260 feet per minute and a feed of 0.040 inch per revolution



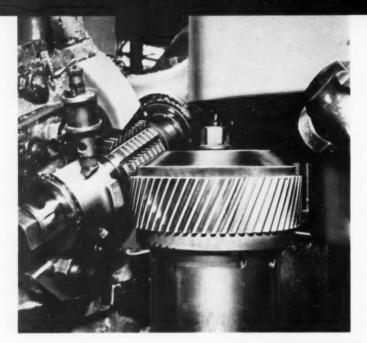
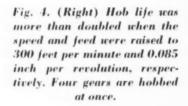
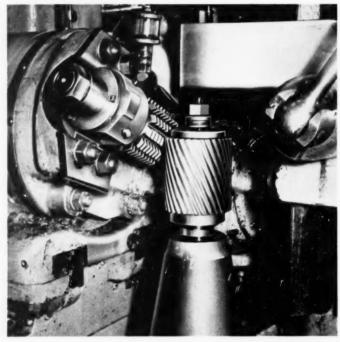


Fig. 3. By increasing the hobbing speed employed for aluminum gears to 410 feet per minute, the number hobbed between regrinds rose from 100 to 180.





roughness on tooth flanks as the result of increased feed rates is permissible. In Fig. 4 is illustrated the set-up for hobbing crankshaft gears four at a time, using a climb-cutting technique whereby the cutting pressure is exerted against the bearings of the machine table. The helical gears have 31 teeth of 10 diametral pitch and the depth is 0.235 inch. The material is freecutting mild steel.

A single-start, high-speed, form-ground production hob of 3-inch diameter is used. Originally, the cutting speed used was 120 feet per minute, and the feed 0.040 inch per revolution, which gave a cutting time of 24.4 minutes for

the four components. This time was reduced to 5.2 minutes when the cutting speed was increased to 300 feet per minute and the feed to 0.085 inch. In this instance, the number of gears cut between regrinds increased from 80 to 170.

## Hobbing Time Shortened from 8.8 to 2.12 Minutes

In another high-speed hobbing set-up, two 5.34-inch diameter gears for a second speed drive are hobbed. These gears have 34 teeth (7 diametral pitch), 0.35 inch deep and 0.864 inch long. The blank is a forging of casehardening, nickel-

molybdenum steel with a Brinell hardness between 149 and 179, and a tensile strength of 110,000 pounds per square inch.

Making use of conventional hobbing methods, the gears were originally cut with a 3-inch diameter high-speed steel hob at a speed of 117 feet per minute and a feed of 0.040 inch per revolution in a time of 8.8 minutes per gear. When the speed was increased to 196 feet per minute and the feed to 0.10 inch per revolution, this time was reduced to 2.12 minutes per gear. In addition, the number of components hobbed per cutter regrind rose from 56 to 60.

One point of interest may be noted in connection with this gear. During preliminary tests, the feed was kept at 0.040 inch per revolution and the speed increased to 268 feet per minute. Measurements of the motor current consumption showed that the horsepower requirement then rose from 1.2 to 3. With the present feed and speed—0.1 inch per revolution and 196 feet per minute—the power consumption is approximately 7 1/2 H.P.

A machine that was designed for use at conventional hobbing speeds and feeds cannot necessarily be expected to withstand indefinitely the stresses imposed by the higher speeds and the greater power that must be transmitted at those speeds. For this reason, a number of machines specially adapted and strengthened for hob speeds up to 750 R.P.M. and feeds up to 0.25 inch per revolution have been ordered by the company.

Experiments in high-speed hobbing were also undertaken by the Ford Motor Co., Ltd., at their Dagenham, England, works. The first tests were undertaken with a set-up on a Cleveland Rigid-

hobber. A range of increased speeds was provided on this machine by the fitting of specially designed adjustable V-pulleys to enable hob speeds up to 500 R.P.M. A 5-H.P. motor was also provided, together with an ammeter to indicate the power consumption.

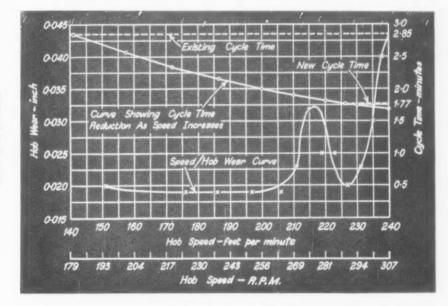
The gear tested was made from steel bar stock which has a Brinell hardness of 179 to 217 in the annealed state. Finished gears are 2.018 inches in diameter, with 15 teeth of 9.25 diametral pitch, a face width of 0.875 inch, and tooth depth of 0.253 inch. The finished component, a transmission reverse idler gear, is shaved after hobbing. A two-start pre-shaving hob 3 inches in diameter by 3 1/2 inches long was used, and two gears were cut in 2.85 minutes at a hob speed of 140 feet per minute and a feed of 0.045 inch per revolution of the work.

The results of the tests carried out on this gear are shown graphically in Fig. 5. A total of 30 gears was hobbed at each of the speeds shown by the lower curve, the hob being shifted after each run of 30 gears, but not during the runs. For measuring the wear on the hob teeth at each speed, after completion of 30 gears, a Brinell microscope having a scale graduated in 0.004 inch divisions was provided. Hobs of the formground production type were used, with the machine arranged for climb-cutting and pressure directed against the table bearings. Light mineral cutting oil was liberally applied, and the gears were hobbed to depth in one pass.

#### Production Time Reduced 38 Per Cent

No sudden increase in hob wear was noted until a speed of 211 feet per minute was reached,

Fig. 5. Graph showing results of a series of tests carried out in hobbing transmission reverse idler gears having 15 teeth of 9.25 diametral pitch



and even then the increase was negligible. At 215 feet per minute, however, hob wear exceeded 0.030 inch. This was reduced to 0.025 inch at 219 and 223 feet per minute, and still further to 0.020 inch at 227 feet per minute—the lowest wear recorded at the higher speeds. Four runs of 30 gears each were made at this speed, and later it was adopted for production, the new cycle time being 1.77 minutes, representing a reduction of 1.08 minutes, or nearly 38 per cent.

Further tests at higher speeds showed rapidly increasing wear, and at 238 feet per minute the tests were stopped in order to avoid interference with production. Pulleys were, however, fitted subsequently to provide a hob speed of 375 R.P.M., when it was found that the wear increased to 0.055 inch for 30 gears. Horsepower consumption also rose to 3.75 while idling, and to 5.35 when cutting.

As applied in production, the 3 1/2-inch long hob is shifted through a total distance of slightly more than 2 inches, and the number of gears obtained per regrind, for both conventional and high speeds, is 450. At the slower speeds, however, more material per regrind was removed from the hob, so that the total number of gears produced by a hob has been increased from about 3220 to 4500.

The tests are to be continued to discover whether there is a further speed at which hob wear is reduced, beyond 300 feet per minute. Owing to production needs, it was also necessary to defer a series of tests at coarser feeds, and

the effects of such feeds are to be investigated at a later time.

It is interesting to note that at the feed rate of 0.045 inch per revolution the initial rise in the hob-wear curve was concentrated between 206 and 227 feet per minute. Any variation in the material hardness or machinability would presumably have a considerable influence upon the form of a curve relating to hob wear and speed, and appreciable changes in hob life might result, for example, from slight variations in supply voltage and consequently in cutting speed. From this series of tests it was concluded that for each specific hobbing operation a similar investigation should be carried out to determine optimum conditions for that operation on a particular machine, and that these conditions should be regarded as critical. It follows, too, that the hobs must be of consistent quality.

Under present production conditions, it has thus far proved impossible to carry out such detailed tests on individual components, and speeds for other gears have therefore been increased in accordance with the information derived from the first series of tests.

#### Hobbing at 245 Feet Per Minute Cuts Time 50 Per Cent

In another set-up on a similar machine, an engine auxiliary drive gear of 1.714-inch diameter, with 18 teeth of 16 diametral pitch, is hobbed. The face width is 1/2 inch, the tooth

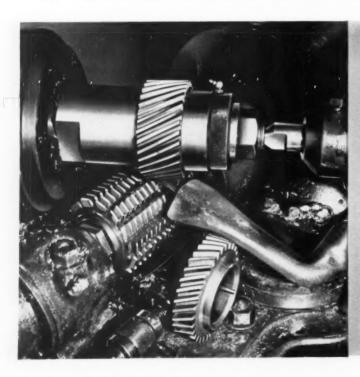
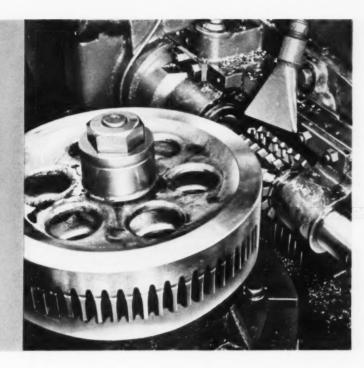


Fig. 6. Crankshaft gears having 31 teeth of 10 diametral pitch are hobbed two at a time with a cutting speed of 220 feet per minute.

Fig. 7. Cutting speeds were boosted from 126 to 176 feet per minute in hobbing a pair of 17.65-inch diameter tractor final reduction gears.



depth 0.1425 inch, and the pressure angle 14 1/2 degrees. Prior to the introduction of high-speed hobbing, the speed employed with the single-start hob was 113 feet per minute, and at a feed of 0.050 inch per revolution, this gave a cycle time of 5.1 minutes. Two gears were hobbed at one setting and finished to within a tolerance of 0.002 inch on chordal tooth thickness and in run-out.

In accordance with the tests described earlier, the hob speed was raised to 245 feet per minute, the feed remaining at 0.050 inch per revolution. Under these conditions, the hob life rose from 500 components per regrind to 550, and the machine cycle time was reduced to 2.35 minutes—representing a gain of 2.75 minutes, or over 50 per cent. Approximately 0.015 inch is removed from the hob teeth at each regrind. These gears are made from steel bar stock and are burnished after hobbing.

The Barber-Colman horizontal hobbing machine illustrated in Fig. 6 is set up for machining helical crankshaft gears from 0.2 per cent carbon steel. This gear has a diameter of 3.668 inches and 31 teeth of 10 diametral pitch. Two gears of 0.810-inch face width are hobbed at once to a depth of 0.23 inch with a 3 1/2-inch diameter, two-start pre-shaving hob, and finished by shaving. This machine operates at 220 feet per minute with a feed of 0.028 inch per revolution. Conventional hobbing is employed with this setup, and the gears are finish-shaved with a rack type cutter.

A set-up on a Gould & Eberhardt 36-inch machine is shown in Fig. 7 for hobbing tractor final reduction gears of 17.65-inch diameter (by 1.76-inch face), two at a time. The blanks are forged from hot-rolled special steel, containing 4.8 to 5.3 per cent carbon, 0.8 to 1 per cent manganese, and 0.15 to 0.25 per cent molybdenum. They are heat-treated and tempered prior to cutting the teeth, to a maximum hardness of 255 Brinell. The gear has 69 teeth of 4 diametral pitch which are hobbed to a depth of 0.5005 inch with a 4 1/2-inch diameter single-start hob.

Both gears are anish-hobbed in a total time of 66 minutes at a hob speed of 176 feet per minute and a feed of 0.035 inch per revolution. Before the experiments described, the hob was run at 126 feet per minute with a feed of 0.028 inch and the cycle time was 115 minutes for two gears. The total number of gears hobbed per regrind is 76, both for conventional and high speeds. Here again, however, slightly less wear occurs at the higher speed, so that the total number of gears obtained per hob has risen from about 1200 to 1500.

Of interest is the fact that in hobbing these final drive gears on a similar machine, a 5-inch diameter inserted-tooth hob, with high-speed steel teeth, is operated at 196 feet per minute with 0.035-inch-per-revolution feed. Both the machines mentioned are arranged for climb-hobbing, and the cutting oil employed for this operation is of the sulphurized fatty type.



The application of ultrasonics to many different inspection and measurement problems is growing as knowledge of this unique non-destructive testing method spreads. Instantaneous indications and accurate location of internal defects are obtained economically with these testing instruments

By CHARLES H. WICK

RAPID and accurate detection of internal defects in various materials is necessary for high quality control and economical manufacturing conditions. The most practical means of finding such hidden flaws is by some non-destructive testing method. One of the latest developments in the field of non-destructive testing instruments is the ultrasonic Reflectoscope made by Sperry Products, Inc., Danbury, Conn. With this portable instrument, instantaneous indications and accurate location of internal defects are economically obtained.

Ultrasonic testing is being widely applied in many industries, not only to determine the existence, direction, and location of flaws, but also to measure thicknesses and study physical properties such as elasticity, porosity, and grain size. Because it is portable, the instrument provides an easy method of testing large parts in place,

# TESTING -- A Versatile New Inspection Method

eliminating, in many cases, the need for disassembly or transportation of components to an inspection area.

Typical users of ultrasonic testing include steel mills, foundries, forge plants, railroads, shipyards, aircraft and automotive manufacturers, metal-working plants, builders of machinery, ordnance works, insurance companies, and plant maintenance departments. Some of the more interesting applications of this method of inspection in various industries will be described in this article.

#### Principle of Operation

In the Reflectoscope, a transmitter delivers high-frequency electrical pulses to a quartz crystal searching unit that is slid over the test surface of the part being inspected. The searching unit transforms the electrical pulses into extremely rapid mechanical vibrations and transmits them into the material under test. These mechanical vibrations, or ultrasonic sound waves, travel with negligible losses through homogeneous materials, but are reflected by mechanical discontinuities.

Vibrations reflected from either the opposite side of the part being tested or any internal defect are transformed back into electrical pulses by the searching unit and delivered to an amplifier. Amplified electrical pulses are applied to the plates of a cathode-ray tube. The plates deflect the electron beam of the tube and cause it to show vertical indications or "pips" on the viewing screen of the initial pulse sent out and all reflections received by the searching unit.

A square wave marker scale is displayed simultaneously on the viewing screen to measure reflection indications for location purposes. This scale can be set for various units of length, so that the operator can accurately determine the distances of defects from the test surface. Calibration is accomplished by applying the crystal searching unit to a standard test block with known dimensions and simulated "defects," such as drilled holes.

It is necessary to know the exact shape and size of the part being tested in order to interpret properly the indications seen on the viewing screen. Reflections will be received from decreases in the cross-section of the part under test (except from gradual tapers), intricate contours, or sharp curvatures and, unless they are known, may be misinterpreted as flaws. Practically any non-porous, resilient material, including aluminum, brass, bronze, magnesium, Monel, and steel can be inspected by ultrasonic methods. Sheets as thin as 1/16 inch, and parts as long as 20 feet, have been tested in this way.

Test surfaces on the parts to be examined must be free of dirt, grease, scale, corrosion, and any burrs or steps. A few quick passes with a portable sander are generally sufficient to prepare the test surface. A couplant such as S A E 10 or 20 oil is usually applied to the test surface to permit ultrasonic transmission from the crystal to the work-piece.

#### Ultrasonic Inspection of Forgings

Ultrasonic inspection is a rapid, economical method of testing forgings for undesirable grain structure and internal defects, quality control, and fatigue cracks. Typical flaws located in forgings by this method are flaking, bursts, segregations, pipes, ruptures, blow-holes, and fractures. Clear indications are generally obtained with ultrasonic inspection because of the inherent, close grain structure of forgings. Forgings that are regularly inspected in this way include bearings, railroad axles, billets, gas turbine discs, rotors, piston-rods, die-blocks, and shafts.



Fig. 1. Forged steel back-up roll is here being inspected by applying an ultrasonic searching unit to body of the roll in a diametric test.

For example, Fig. 1 illustrates an ultrasonic searching unit being applied to the body of a forged steel back-up roll during a diametric test. Such forgings are also inspected from both ends, using a 1-megacycle testing frequency to penetrate the roll from end to end. Ultrasonic inspection of new rolls is enabling producers to detect defective material before costly machining, and also protects users against mill shut-down and damage due to failure of rolls in service.

Many producers of tool steels are using this non-destructive method of testing for routine inspection. For example, the Heppenstall Co. maintains a program of 100 per cent inspection of every die-block produced. Each block receives an ultrasonic inspection, as seen in Fig. 2, after forging, heat-treating, and rough-machining, to insure the maintenance of high quality. Dieblocks tested in this way vary in size from a 1-inch to a 4-foot cube. Sound is beamed through

the material from various points to insure freedom from porosity, forging bursts, and flakes.

Another extensive use of ultrasonic inspection is for testing forged axles and crankpins in the railroad industry. For instance, the Erie Railroad has eliminated road failures of axles and crankpins by employing three Reflectoscopes to test all heavy freight and passenger locomotives once each month for fatigue cracks. In addition to increased safety, substantial savings have been realized due to reduced maintenance.

Axles can be tested ultrasonically throughout their entire length by moving the searching unit over one end of the axle, Fig. 3. Crankpins should be inspected from their large ends, as testing from their small ends will detect only the deepest cracks in the inner sections. Normally, indications will be received from each decrease in section and from oil-holes in the crankpin, and it is necessary therefore to carefully exam-



Fig. 2. High quality of tool steel die-blocks is insured by 100 per cent ultrasonic inspection following forging, heat-treating, and rough-machining.

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ine a blueprint of the part during inspection for proper interpretations of defect indications.

The use of a Reflectoscope for maintenance inspection of guide columns on a large hydraulic press is illustrated in Fig. 4. Other parts of the press that are inspected in this way are strain rods, manifold bolts, pistons, gland studs, pump shafts, cast base pads, and supporting members. The instrument can be hoisted to any section of the press for inspecting various parts in place. Periodic inspection of such parts makes it possible to detect and watch the growth of fatigue cracks, and schedule replacement of parts without prolonged shut-downs.

The Aluminum Company of America uses the Reflectoscope regularly for the inspection of its extrusion presses. On data provided by ultrasonic inspection, nineteen press columns have been removed before failure—resulting in a savings in press damage and "down" time which has been estimated to exceed \$1,000,000.

#### Method Applicable to a Variety of Castings

Press cylinders, gears, rotors, back-up rolls, and crankshafts are among the castings tested non-destructively by ultrasonic methods. Defects such as cracks, porosity areas, shrinkage cavi-

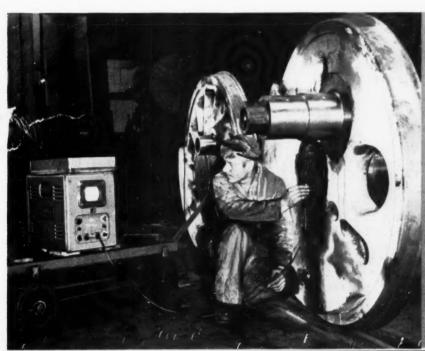


Fig. 3. (Left) Forged railroad axles are tested ultrasonically throughout their entire length by moving the crystal searching unit over one end of axle.

Fig. 4. Guide columns, strain rods, manifold bolts, pistons, shafts, and other parts of hydraulic press are periodically inspected with Reflectoscope.

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Fig. 5. Mechanite Diesel engine crankshaft, 12 feet long, that had failed in service is ultrasonically tested to determine the extent of the defects.

ties, blow-holes, voids, and inclusions, can be quickly detected and accurately located, and in many cases, faulty spots can be cut out and the casting repaired. By locating defects in castings at the foundry, the cost of shipping and installing parts that might break down in service is avoided. Also, the possible breakdown of parts already in service is prevented.

In general, castings made from the lower carbon steels permit greater ultrasonic penetration. However, other factors have more effect on the penetrability of the material. Where cast iron is quite coarse, and free carbide or flake graphite is present, scattering of the sound beam occurs. Best results are obtained with low frequencies, since longer wave lengths by-pass irregularities too small to cause rejection. Effective depths of penetration in castings may vary from 4 to 36

inches, although cast-steel rolls have been penetrated to distances over 20 feet.

Meehanite castings of various compositions have been tested ultrasonically with satisfactory results. For example, the Diesel engine crankshaft seen in Fig. 5 is a Meehanite casting 12 feet long having journals 7 inches in diameter by 9 inches long. This crankshaft had already failed in service, and the ultrasonic test was made to determine the extent of internal defects before being repaired. A 1-inch round, 2 1/4-megacycle searching unit and a 1/2-inch round, 5-megacycle unit were employed for the tests.

Thousands of dollars can sometimes be saved by the ultrasonic inspection of a single part. For instance, the cost of machining the large cast gear blank seen in Fig. 6 may be as much as \$5000. By testing the blank (which has an out-

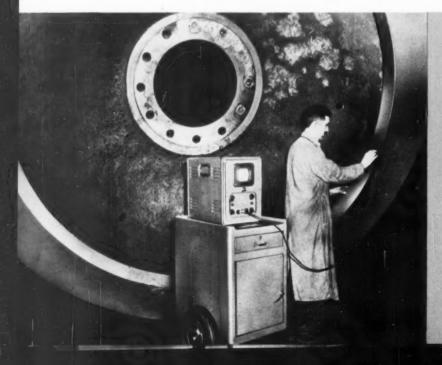


Fig. 6. Large cast gear blanks having an outside diameter of 130 inches are tested to avoid cost of machining castings having internal defects.

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side diameter of 130 inches) prior to machining, the costly machining of a defective blank can be avoided. In one case, sub-surface shrink tears were detected in a gear blank by the use of the Reflectoscope.

Cold-drawn products—such as bars, rods, and finished parts of various shapes and in lengths up to 30 feet—can be readily and economically inspected by ultrasonic methods. The Reflecto-scope shown in the heading illustration is used by the Molloy Mfg. Co. to test 2000 transmission shafts per day for hidden internal defects. These shafts are supplied to two major automobile corporations, and precautions are taken to prevent failures of the parts in service.

#### Ultrasonic Inspection in Aircraft Industry

The increased application of new materials—which can withstand the high temperatures and terrific stresses encountered in modern supersonic aircraft—makes the use of some method of non-destructive testing of the materials practically mandatory. Nearly all aircraft and aircraft engine and accessory manufacturers are employing the Reflectoscope for this purpose.

Grumman Aircraft Engineering Corporation is now taking advantage of this new testing technique to guarantee that their materials meet the requirements for critical parts to be used in jet planes. Steel and aluminum-alloy blocks up to 2 feet thick and weighing as much as 2 tons are inspected ultrasonically to locate internal defects. When defects are found, stress analysis engineers stamp the blocks with pertinent information, and plot the size and shape of the defects. Then, the blocks can be allocated to the machine shop for best possible use.

Rough forgings are machined on one side to insure intimate contact with the Reflectoscope searching unit. A complete scanning of the piece is then made. After stamping, as seen in Fig. 7, the inspected forgings are photographed to provide a ready reference file for careful study and analysis prior to designating the material for a specific part. In this way, costly man-hours and machine time can be saved by avoiding the machining of defective materials. Even after assigning forgings from this photographic file, stressed fittings for the aircraft are checked during various stages of their manufacture to insure that no imperfections have developed.

#### Inspection with Angle-Beam Units

Angle-beam searching units, in which the beam is projected into the material at an acute angle to the surface, are used with standard Sperry Reflectoscopes to test parts, sheets, or plates having a thickness less than 5/8 inch;



Fig. 7. Steel and aluminum-alloy blocks to be made into critical parts for jet planes are inspected and stamped prior to allocation for machining.

Fig. 8. Wall thickness of pipes carrying erosive or corrosive materials is periodically measured to determine when replacement of pipe is necessary.





Fig. 9. Defects in casing and tubing couplings are quickly detected and located with this semiautomatic set-up. Couplings are rotated over a searching unit.

areas not accessible for testing with longitudinal beam searching units (such as welds, tapered blades, and fanblade roots); and pipe and tubes.

The angular beam of ultrasonic waves is successively deflected from the surfaces of the material, or from discontinuities, until it strikes a defect in such a way as to cause all or part of the beam to reverse direction and be reflected back to the searching unit. This causes the appearance of an indication on the viewing screen to the right of the initial pulse. Due to the zigzag path taken by the ultrasonic beam when the angle-beam searching units are used, the actual length of material penetrated by the Reflectoscope is greatly reduced. For angle-beam testing, the searching unit crystal is mounted at an angle with its face against a wedge of plastic. The opposite face of the plastic wedge provides the working surface of the unit.

Rod welds, electric welds, and pressure welds lend themselves to the ultrasonic method of inspection. It is essential, however, that the weld have a relatively uniform bead or no bead; that the work surface for 5 or 6 inches on one side of the weld be clean and uniform; and that the parent metal adjacent to the weld have a fairly uniform grain structure.

In testing a specimen butt weld, the anglebeam searching unit is moved over the surface of the material adjacent to the weld. Welds in plates ranging from extremely thin sections to thicknesses of 4 or 5 inches can be angle-beam tested for proper fusion. Also, welds in lower density aluminum and magnesium alloys can be ultrasonically tested equally as well as welds in ferrous metals, and extremely small defects can be located.

Tubing, pipe, and bar stock can be readily in-

spected with angle-beam searching units having curved plastic adapters shaped to fit the cylindrical contour of the part to be tested. For example, the Reflectoscope has been found to be a practical tool for the field inspection of boiler tubes. Through its use, ninety sections of defective tubing (representing over 1500 feet of 2-inch diameter, chromium-molybdenum superheater tubes) were detected and replaced in the convection-superheater outlet section of two boilers of large size.

#### Thickness Measurement is an Important Application

In addition to its many testing possibilities, ultrasonic inspection is well adapted to many types of measurement applications where only one surface is available. Variations in thickness from 3/8 inch to 12 inches or more can be measured accurately, and several measurements have been taken of parts as long as 20 feet with an accuracy of 5 per cent. In one technique, markers on the Reflectoscope screen are set up with a specimen of known thickness, and it is possible to read an unknown thickness along the markers.

Simplified thickness measurements and improved accuracies can be obtained by a portable, ultrasonic instrument called the Reflectogage. Steel thicknesses ranging from 0.014 to 0.400 inch can be measured with this instrument. The circuit is specially designed to remove all false signals, and a single sharp signal indicates the thickness. Tolerance markers appear as a downward square step on the base line, and a calibrated tape proportional to the screen size is provided.

An interesting application, shown in Fig. 8,

is the measurement of wall thickness of pipes carrying erosive or corrosive materials. Periodic checking of the progressive thinning of the wall permits slight rotation (to bring a thicker section of pipe to the bottom) or replacement of the pipe when necessary.

#### Semi-Automatic Set-Up Speeds Inspection

Ultrasonic inspection operations can be accelerated by providing semi-automatic set-ups, such as the one seen in Fig. 9. In this installation at the Wheeling Machine Products Co., defects such as external or internal cracks, pockets, or inclusions in casing and tubing couplings can be quickly detected and located.

Couplings are fed into position for inspection from a magazine seen at the right. At the inspection station, the coupling rests on a pair of spindles that are rotated by a geared electric motor. The coupling is traversed over an anglebeam searching unit mounted between the two support spindles by rotating a handwheel. A gravity chute (left) is provided for unloading.

#### Immersed Testing Eliminates Need for Direct Contact

One of the latest methods of ultrasonic inspection, particularly suitable for irregularshaped pieces and certain surfaces, is to immerse the part to be inspected in water. In this way, direct contact between the searching unit and surface being inspected is not necessary. Because of the sensitivity of the amplifier in the Reflectoscope, this method is practical in spite of the energy losses where the sound beam leaves the water and enters the part.

An installation of immersion type ultrasonic testing at the McDonnell Aircraft Corporation is illustrated in Fig. 10. In this set-up, the operator accurately positions and directs the scanning mechanism by means of push-buttons.

Another immersion type of ultrasonic testing unit is now being built by Sperry Products for the Allison Division of General Motors Corporation. This unit will permit quick, accurate, and automatic inspection of smoothly contoured rotor forgings for jet engines.

This immersion method can also be used to examine grinding wheels for internal discontinuities. In one set-up, a pair of immersed searching units were mounted in a holder facing each other, and the grinding wheels were mounted on an arbor and placed between the centers of a lathe for ease of rotation between the searching units.

With this set-up, it is possible to locate internal discontinuities by loss of transmission of signals through defective areas in the grinding wheels. Large cracks show as a complete loss, whereas smaller areas show definite reduction of received signals. Better results are obtained in testing ceramic bonded wheels, as resin bonded wheels permit a very poor penetration of sound.

Fig. 10. Irregular-shaped parts can be ultrasonically tested by immersing in water. In this setup, scanning mechanism is controlled by push-buttons.



# TAP BREAKAGE PROBLEM SOLVED BY HIGH-SPEED PHOTOGRAPHY

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A LTHOUGH the use of high-speed photography for the solution of mechanical failures in manufacturing has gained widespread acceptance during the last few years, many engineers fail to realize the usefulness of this new industrial tool—due in part to unfamiliarity with the equipment and its potential applications. High-speed motion pictures can, however, be of value when mechanical failures occur.

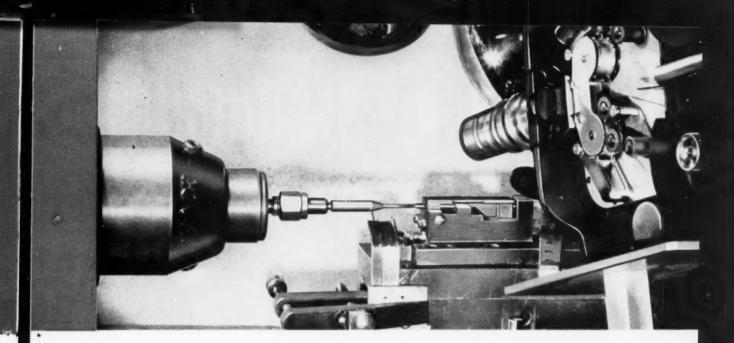
In a typical case in which high-speed photography helped to solve a production problem, a No. 10-24 NC-3 four-start (0.0416 pitch, 0.1664 lead), left-hand thread had to be tapped 1/2 inch long in a piece of brass material. The equipment used was a high-speed, horizontal spindle tapping machine driven by a 1/4-H.P., three-phase motor. An electrical cut-off switch set ahead of the mechanical stop limit caused the motor to decelerate instantly, reversing its rotation and returning to the starting position. A general view of the set-up, including the high-speed camera, is shown in the heading illustration.

On the recommendation of tap manufacturers, a set of three taps—consisting of a roughing, a semi-finishing, and a finishing tap—was used to produce the thread. They were designed with pilots to insure alignment of the tapped hole with a bored hole in the opposite end of the part. The set-up showing the part located in a fixture and a tap about to reach the point of engagement may be seen in Fig. 1.

A production lot was successfully tapped with the No. 1 roughing tap. Consistent breakage occurred, however, with the No. 2 semi-finishing tap. The breaks in this instance were of two types: one was lateral, seen at the top of Fig. 2; and the second was transverse, shown at the bottom. Adjustments of the equipment and the fixture were made with no appreciable lessening of the tap breakage.

At this point, high-speed photography was brought into play in an effort to analyze the problem. A series of high-speed pictures were taken at the rate of 3000 frames per second until a tap broke. It was noted on the films that prior to the breakage, the tap was sliding forward slightly during the cycle. This sliding built up to the point where the alignment pilot of the tap struck the right-hand end of the fixture, causing the lateral tap breakage. After tightening the tap more securely in its chuck, additional runs were filmed. Within a few cycles the transverse break occurred. Although the films showed that the slippage of the tap had been eliminated, it was observed that the spindle was revolving in the direction of tapping at the time the tap broke. Then it continued momentarily in the counterclockwise direction while the spindle was withdrawn, before reversing its rotation.

A film study of the No. 1 roughing and the No. 2 semi-finishing tap showed that the breakage was due to the rotational motion continuing after the mechanical stop was reached. The deceleration time of the spindle, chuck, and tap, after the electrical cut-off and prior to reversing, varies inversely with the frictional resistance.



The No. 1 roughing tap, which was doing the heavy initial thread cutting, was braked by a greater frictional force than the No. 2 tap. Thus, the rotational inertia drew the semi-finishing tap further into the part, causing the spindle to strike its mechanical limit, and thus breaking the tap by a tensile force. In fact, as previously noted, the direction of spindle rotation was not reversed until the spindle had started to return to its original position.

The effect of the spindle reaching its mechanical limit did two things. First, it caused the tap to slide forward in the spindle until the pilot bottomed on the fixture, causing a lateral break. Second, when the mechanical limit was reached and the tap was prevented from sliding in its chuck, the result was the transverse break due to the rotational inertia being sufficient to pull the tap apart as it was drawn into the material.

The head of the machine was disassembled to permit adjustment of the cut-off switch, assuring an earlier interruption of the circuit to prevent the spindle from bottoming against its mechanical stop. All parts were then tapped with the No. 2 semi-finishing tap, as well as the No. 3 finishing tap, without damage to the taps. To eliminate the repeated time-consuming adjustments of the electrical cut-off switch that would be necessary when changing taps, the fixture was made adjustable to compensate for the various lengths of stroke required. This was a satisfactory arrangement, permitting rapid set-up and insuring the elimination of tap breakage.

Fig. 2. Two forms of tap breakage occurred—the lateral break (top) and the transverse break (bottom).

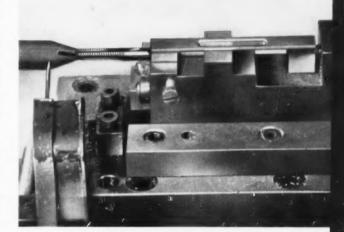
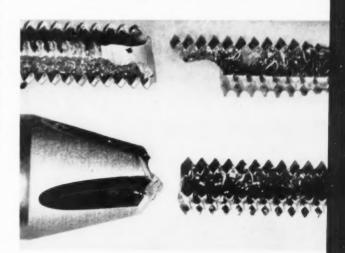


Fig. 1. (Above) Tap—designed with pilot to insure thread alignment with opposite bored hole—may be seen entering the work located in a fixture.



# PRESENT-DAY TECHNIQUES



NEW importance is today being placed upon the art of spinning as a practical and economical means of forming aluminum. Many metal fabricators throughout the country are realizing more and more the unusual potentials offered by this well-known, but often overlooked, production method. Until recently, spinning had been considered a means for producing job lots requiring only a few to several hundred pieces. Now parts are being spun in lots of thousands because of better and faster spinning techniques and because of the advantages aluminum offers as a natural spinning medium.

A factor largely responsible for this renewed interest in spinning rests in the development of semi-automatic and automatic spinning equipment which makes large production runs possible. Although most automatic machines spin only conical shapes, there are developments in progress designed to increase the range of shapes capable of being spun on these machines, and also to create fully mechanized spinning lathes. With the automatic machine shown in Fig. 1, it is possible to control the flow of metal somewhat more efficiently than in manual spinning. Then, too, by maintaining predetermined pressures on the roll type spinning tools, work-hardening can be closely controlled. Automatic spinning lathes are used to advantage on first operations or hard-to-produce conical shapes which may then

## OF SPINNING ALUMINUM

Spinning is finding widespread application in the production of sheet-metal parts for which other methods of fabrication are not feasible. Low cost of tooling is a dominant factor in the choice of spinning as against drawing or forming as a production method

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be press-formed to meet unusual requirements. This combined forming technique may easily eliminate repeated annealing delays or other time-consuming operations.

One of the chief advantages of using spinning as a fabricating method is the relatively low tooling cost. Forming dies used in press operations are generally quite expensive: over-all costs mount with the size and intricacy of the dies. A die for the radar screen in Fig. 2 would be prohibitive. Though it is true that many hundreds of parts can be produced with a set of dies, it is also true that unit cost, in some instances, may exceed the cost for a similar part produced by spinning.

Certain factors should be carefully weighed before making a decision between spinning and press-forming. These include the type of part to be produced, the aluminum gage and alloy specified, the tolerances to be held, the quantity required, and the time element involved. In those instances where only a small number of parts are needed and wooden chucks can be used, the tooling cost for spinning is but a fraction of the die cost for drawing or stamping. A conical shape, although difficult to draw, is one of the easiest forms to spin. Therefore, it would be less expensive to produce a conical part by spinning. Then too, light-gage metal can be economically spun into any of the basic shapes.

Spinning aluminum requires a technique different from that used in spinning steel. The ease with which certain aluminum alloys work requires that a light touch and rapid stroke be used. When handled correctly, aluminum will form more rapidly than ferrous metals of similar characteristics. Because there is a difference in working this light metal, it is desirable, where possible, to assign aluminum jobs to certain individuals, trying not to change or alternate from ferrous to non-ferrous metal.

Several different actions take place during the spinning of aluminum. As the metal flows and the shape develops, there is a change in the characteristics of the part. Work-hardening occurs to a definite degree. In some instances, a 61S-O aluminum alloy may become 1/8 to 1/4 hard due to the spinning. Annealing will, of course, restore the original ductile qualities of the alloy.

Thinning is another change that takes place, especially during the forming of a hemispherical or a cylindrical shape. The skill of the spinner, however, may be such that thinning can be controlled at certain points on the chuck. To maintain a more uniform gage in the spun part, the operator causes the metal to flow back upon itself. A stroking action is necessary to do this. The spinning tool is caused to contact the work at a point on the blank from which metal can be drawn and forced back into the section being formed. Manipulation of the spinning tool actually crowds the metal from the tool contact point into the finished shape. A schematic drawing in Fig. 3 indicates how this action takes place.

#### Three Basic Spun Shapes

Although it is possible to spin many round and circular shapes, there are three basic forms that encompass the major portion of all spinning op-



Fig. 1. Conical shapes are being spun automatically by this baltery of Spincraft machines

erations. The simplest shape to form is the cone, followed by the hemisphere, and finally the cylinder. Line drawings in Fig. 4 illustrate these shapes in the order of their fabricating complexities. All have radial symmetry, which is the chief requisite for this method of fabrication.

Spinning a conical shape is comparatively easy. The depth and angle to which this shape may be spun depends upon the type of aluminum used. Various alloys react differently. For example, 2S-O or 3S-O aluminum will spin more easily than 24S-O aluminum, as can be seen from the accompanying table. Regardless of the basic shape being spun, the aluminum alloys react in the same manner. The difficult-to-handle alloys multiply the problem by the intricacy or demands of the finished part.

Hemispherical shapes, the next most difficult

to form, require little initial effort due to the small angle through which the metal is moved. As the spinning operation progresses, however, the outside angle formed between a tangent to the chuck and the unformed metal, at the point of tool contact, becomes greater. Because of this, it is more difficult to shape the aluminum to the contour of the chuck. Unlike spinning a conical shape in which there is uniform metal flow, the blank used in the hemispherical shape must be worked along each section of the form. This often results in thinning and work-hardening.

The cylindrical shape creates the most difficult problem in spinning. After the blank is secured in place, a sharp angle must be made to start the spinning cycle. An unusual strain is set up as the metal is spun over the chuck. Thinning and hardening occur with each successive step to a

(Photo, courtesy of Spincraft, Inc.)

Fig. 2. Prohibitive cost of a forming die for this radar screen made spinning the only practical means of fabrication.

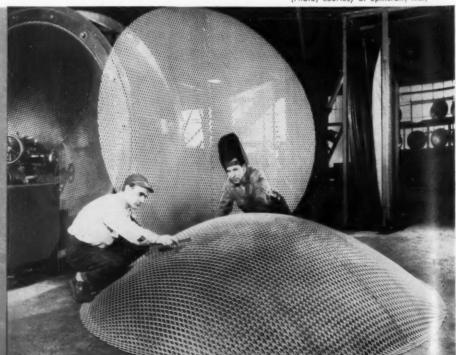
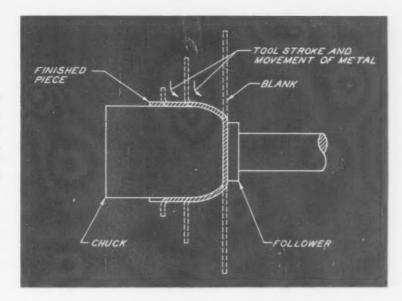


Fig. 3. Metal thinning is one feature of spinning that must be controlled. This can be overcome to a great extent by a stroking action as shown, whereby metal is drawn from the blank and forced into the section being formed.



greater degree than is experienced in forming the hemispherical shape. Ordinarily, cylindrical shapes require a high degree of skill to produce.

#### Spinning Applied in Primary or Secondary Operations

From these basic shapes, further operations will produce other configurations that are common to spinning practice, such as those illustrated in Fig. 5. Although this drawing indicates secondary spinning operations, it is both possible and practical to use spinning as a primary operation, completing the part in one or more secondary mechanical pressing operations. The importance of this method of fabrication is creating new interest in spinning. Design engineers are now able to create shapes which would be too difficult or costly to produce in any other way. The flexibility of this method of production is further realized by initially forming various shapes on press equipment, followed by secondary, or final, spinning operations.

Spinning offers another important means of fabricating unusual or difficult parts in addition

to the combined operations mentioned. Circular sections for a complete assembly, a typical example of which may be seen in Fig. 6, may be spun as an integral unit. For this assembly, two concave spinnings were welded together to form a hollow circular tube resembling a tire. The weldment was then cut into sections of required length and closed at both ends with individually spun end caps. Components may be seen in successive stages of assembly in Fig. 7.

#### Spinning-Lathe Chucks Similar to Forming Dies

In a broad sense, there is a similarity between the chuck used on a spinning lathe and the forming die employed on a press. Both are designed to produce a definite shape. The chuck, sometimes called a form or mandrel, is usually made of laminated hard wood, light metal, or, where production runs occur, mild steel.

In producing a wooden chuck, it is necessary to work to close dimensions. The wood, under spinning pressure, has a tendency to yield, which is an advantage as far as springback in

#### Adaptability of Aluminum to Spinning

Aluminum Alloy	Relative Formability		Ultimate Strength.	Optimum Forming Pressure,	Yield Strength.	Elongation.
	Shallow Spinning*	Deep Spinning*	Pounds per Square Inch	Pounds per Square Inch	Pounds per Square Inch	Per Cent
2S-0 3S-0 4S-0 24S-0 50S-0 52S-0 61S-0 75S-0	1.00 1.00 0.85 1.00 0.94 0.80 0.90 0.53	1.00 0.99 0.65 0.75 0.88 0.55 0.80 0.42	13,000 16,000 26,000 27,000 21,000 28,000 18,000 33,000	8000 10,000 16,000 16,000 13,000 15,000 10,000 18,000	5000 6000 10,000 11,000 8000 13,000 8000 15,000	35 30 20 20 24 25 25 17

Ratings relative to 2S-O aluminum alloy which is taken as 1.00 Per cent elongation calculated on the basis of specimens 2 inches long by 0.064 inch thick

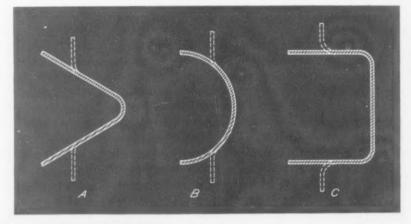
the part is concerned, but a disadvantage where over-all accuracy must be rigidly held. A chuck slightly over size would tend to compensate for the yield factor. Obviously, these chucks will not produce shapes as accurately as metal chucks but, because they are easy to make, they are used primarily on short runs. Should the spinning be unusually severe, however, it is possible to insert metal plates at the critical wear points, as shown in Fig. 8. Wear plates are also placed on large-diameter chucks where the use of solid metal would be impractical because of weight and cost.

A broad variety of chucks are used to create different spun parts. All have one thing in common; the forming is done radially. Many chucks are arranged to receive a solid blank, which is then spun to the desired shape in one set-up.

It is not always possible, however, to complete a spinning operation on a single chuck. Often, when light gage metal is spun, breakdown operations are required. If this occurs, a series of breakdown chucks are provided, as shown in Fig. 9. These chucks are usually rough forms as far as accuracy of contour is concerned. The final chuck used has the exact contour desired.

A sectional or segmental type chuck is a spinning form made up of accurately fitted units which can be disassembled by removing a center or key section. The principal feature of this chuck is that a cylindrical shape having a relatively large body and narrow throat can be spun. A bottle-shaped vessel, or ampoule, would be indicative of this type of spinning. The blank is placed on the sectional chuck and spun in the same manner as any other shape. To remove the part from the chuck, the center (or key) section is withdrawn, permitting the outer sections to collapse within the work-piece. The pieces are then removed through the narrow throat opening. A sectional chuck is illustrated in Fig. 10.

Fig. 4. (Right) Cone (A), hemisphere (B), and cylinder (C) represent the three basic spun shapes—in the order of their difficulty to form.



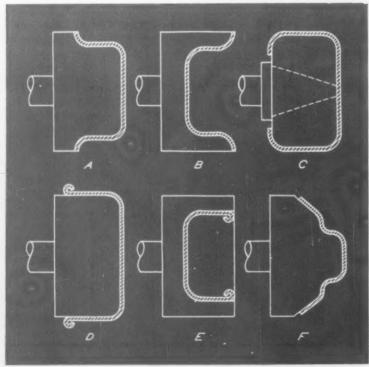
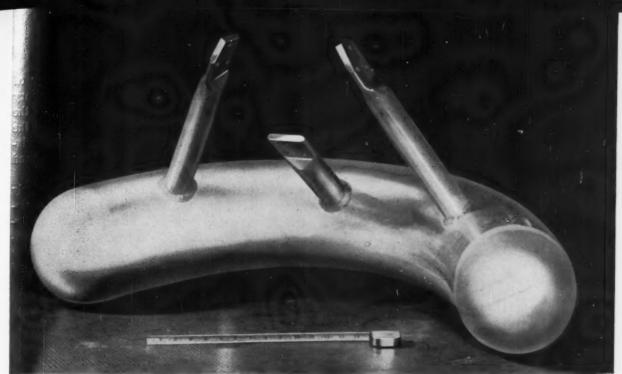


Fig. 5. The six shapes illustrated are typical examples of reworking in a secondary operation. An outside flange is shown at both (A) and (B); an inside flange at (C); an outside bead at (D); an inside bead at (E); and a reducing angle at (F).



(Photo, courtesy of Spincraft, Inc.)

Fig. 6. With the exception of the three support brackets, this assembly is composed entirely of spun components.

In instances where sectional chucks are not adaptable to the work, an off-center form roll can be used to perform bulging and necking operations common to vaselike shapes. This roll requires definite clearance through the throat opening, and in some instances may not prove as efficient as the sectional or collapsible chuck. The off-center roll does not give the same internal support as the sectional chuck.

Another type of chuck which is employed in spinning operations, illustrated at B and E in Fig. 5, is the nest type chuck. It merely provides a means for holding the previously spun shape while internal beads, internal flanges, and some-

times external flanges are spun on the part. The same type of chuck could be used for internal sizing, if required.

#### Spinning Tools Lack Standardization

The types of tools used for spinning various shapes in aluminum are selected largely by the individual operator. Where one spinner might favor a particular tool, another might use an entirely different one to produce the same shape. As a result, spinning tools have not been standardized as have expendable metal-cutting tools. An added reason for lack of standardization is

(Photo, courtesy of Spincraft, Inc.

Fig. 7. Body of curved assembly illustrated in Fig. 6 is shown in its intermediate stages of manufacture. Two circular, concave spinnings are welded together to form a "tire," and then cut into required sections. The end caps also are spun.



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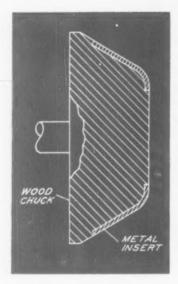


Fig. 8. Chucks made of wood can be adapted for severe spinning operations on short-run jobs by the use of metal inserts, called wear plates, as shown. On large-diameter jobs where solid metal chucks would be impractical, wooden chucks with wear plates are employed.

the simplicity of such tools. They range from ordinary hard-wood sticks to more elaborately shaped metal tools. Also, the low cost of such tools encourages individual choice.

Although manufacturers of spinning lathes usually furnish a set of spinning tools with each machine, most workers prefer to make their own. In most instances, they consist of a shaped and polished tool steel blade fitted into a wood handle. For an average light-duty operation, a tool having a blade 8 inches long and a handle 20 inches long is considered satisfactory. For heavy-duty work, the blade may be 24 inches long fitted into an 18- or 20-inch handle.

The wooden handles of the tools are held under the spinner's arm, and pressure is exerted by combined body weight and movement. Pressure applied in this manner is, of course, limited by the strength of the operator. To increase the amount of pressure exerted through the tool, several devices are used, the most popular of which is the scissors type lever. It is an auxiliary unit that pivots on a T-rest and is linked to the spinning tool, as shown both in Fig. 11 and the heading illustration. Through lever manipulation, sufficient pressures are applied to the hand tool to spin aluminum up to 1/4 inch thick.

Although fully automatic equipment is largely in the developmental stage, semi-automatic operations are being performed by means of hydraulic and pneumatic cylinders used in conjunction with spinning tools. The cylinders are mounted on the cross-slides of the lathes and can be swiveled by hand.

It is desirable, wherever possible, to spin aluminum blanks into their final shapes with a minimum number of tool passes or strokes. Breakdown operations on large or deep spun parts must be held to the smallest number compatible with practical production, as excessive spinning and part handling will cause the blank to work-harden. If this does result, the partially finished blank must be removed from the machine and annealed. Certain parts, due to size, gage of metal, or shape, require intermediate annealing to rework the metal to final shape.

The technique of annealing will vary with different companies, but the purpose remains the same. Considerable care is required: should the heating cycle remain at high temperatures too long, excessive grain growth may result, creating added problems in subsequent spinning operations. Optimum application of heat, which is determined in part by the spinner's knowledge of the hardening under the tool, is desirable. The maximum amount of cold-working, just short of cracking, should take place before the part is removed from the chuck for annealing. Annealing localized areas of hardness is undesirable.

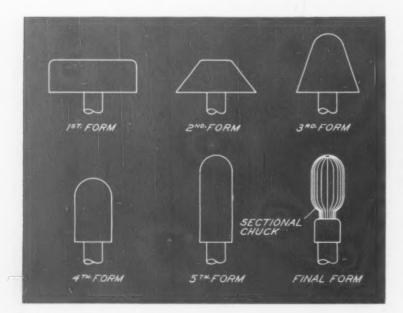
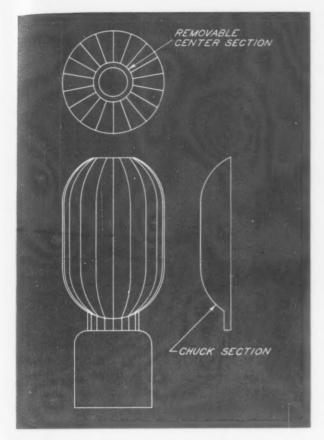


Fig. 9. Some parts cannot be spun to their final shapes on a single chuck. A series of intermediate, or breakdown, chucks similar to those illustrated, are necessary to permit progressive forming from blank to completed part.



Many parts are heated with an open flame or torch. This procedure is often necessary to facilitate spinning and simplify breakdown operations. Such open-flame heating is widely and effectively used even though the practice may result in uneven tempering. Experimentation is sometimes necessary in establishing annealing

practices; consequently, a definite rule or procedure cannot be firmly established. This is especially true where large-diameter parts of difficult-to-spin alloys are used.

#### Lubricants Required in Aluminum Spinning

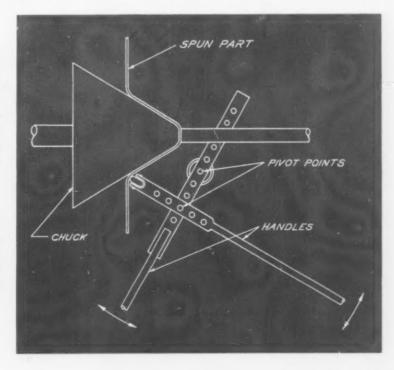
Suitable lubricants are necessary to reduce tool friction in spinning aluminum. The amount of friction created varies with the alloy used and the depth of the part being spun. Various lubricants are available that can be used effectively on different types of spun parts. The choice of such lubricants depends on the individual job.

Two primary considerations in the selection of lubricants are whether the metal will draw satisfactorily when the particular lubricant is used, and whether it can be readily and economically removed. For deep spun parts, a heavier grease type lubricant should be used. This lubricant must adhere to the metal under the most severe spinning operations. It must also withstand the direct application of a certain amount of heat. For example, if a large part requires several breakdown operations, it is sometimes necessary to use an open flame on the metal to simplify the work. The lubricant, in such instances, must be able to withstand this flame heating.

Shallow spun parts will not ordinarily require the heavy viscous type greases used for deep spun parts. In most instances, a good grade yellow laundry soap with a naphtha content is entirely satisfactory. Special waxes can be used, in which case their removal must be considered.

Fig. 10. (Above) Vessels designed with relatively large bodies and narrow throats can be spun by using a sectional type chuck such as the one shown. The completed part is removed by withdrawing the center, or key, section of the chuck, thus permitting the outer sections to collapse within the work-piece.

Fig. 11. (Right) By means of the scissors type lever arrangement here shown, much greater pressure can be applied to the work-piece than would be possible merely by the strength of one man.



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# CARBIDES-Advantages and Limitations

A LTHOUGH a comparatively recent addition to the field of metal-working, cemented carbides have come a long way in performance. Their inherent properties of strength, hardness, and durability have raised them high in the sphere of metal cutting. Still, many improvements are desirable in order to adopt this material to additional standard applications and also to the new metals continually being developed.

Carbides were used originally to replace diamonds in wire-drawing dies. A composition of tungsten carbide with a cobalt binder was employed for the first dies. This same material was later applied to the machining of cast iron with good results. The success of this initial material with cast iron did not, however, follow through in the cutting of steel. Excessive cratering of the straight tungsten-carbide grades made the machining of steel impractical. The situation was corrected by the addition of titanium and tantalum carbides—improving the crater and wear resistance of the carbide to the point where it could be used economically on steel.

#### Composition and Properties of Carbides

Constituents of cemented carbides are limited and have changed little since the steel-cutting grades were developed. Newer grades are really variations in proportion and microstructure rather than in basic composition. The addition of tungsten carbide during the manufacture of cemented carbides increases their hardness.

As the percentage of cobalt binder in the composition is increased, the strength of the carbide will also increase until a certain point is reached. At this point, the strength of the alloy will begin to drop off due to an abundance of the ductile binder. Different grades of cemented carbides can be formulated to do specific jobs by varying the percentage of tungsten carbide, tantalum carbide, titanium carbide, and cobalt. The properties of these grades depend on the composition and the processing techniques.

Of the many desirable properties attributed to carbides, the most important are their modulus of elasticity, hardness, compressive strength, structure, and tool life. The modulus of elasticity of this material is two and one-half to three times that of steel. A hardness ranging from 85 to 93 Rockwell A is average.

Hardness at room temperature is significant, but more important is the hardness at the higher temperatures encountered during machining. It may be noted from Fig. 1 that carbides hold a fairly uniform hardness advantage over both high-speed and carbon steels up to 1200 degrees F. Beyond this temperature the carbides retain their hardness to a great degree while the steels drop off sharply.

Compressive strength is also an important property. The ultimate compressive strength of carbides begins where that of steel leaves off. This property, when considered along with the many other properties of carbide, adds up to successful machining, since the tool will be under compression while cutting.

The microstructure of carbide is consequential in determining its properties, much the same as the microstructure of steel is in determining machinability. A good example of this is the comparative illustration, Fig. 2, of the microstructure of two different grades of carbide. Although

both grades have identical compositions, consisting of 94 per cent titanium carbide and 6 per cent cobalt, their physical properties differ greatly. This is due to the variations in their microstructures.

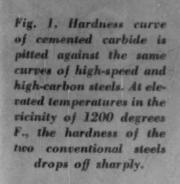
Carbides can be compared to other tool materials on the basis of the tool life obtainable. Under the same conditions, the life of carbide cutting tools is, in most cases, three to four times longer than that of high-speed steel cutting tools. Often, carbides will give ten to twenty times the life of high-speed steel.

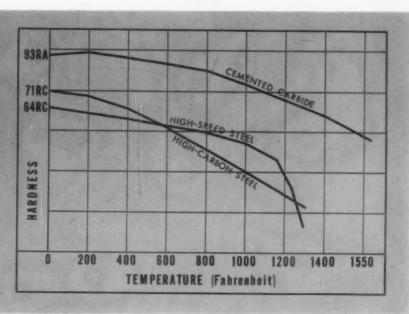
Most good things, regardless of how favorable they may be in some respects, have certain drawbacks. Carbide is no exception. It falls short of necessary qualifications with regard to impact strength, thermal shock resistance, and lastly, endurance or fatigue strength. All of these items tend to result in chipping of the cutting tool.

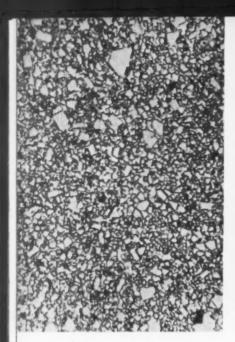
Impact strength is an essential property as it represents the ability of the material to withstand interrupted cuts. Thermal shock resistance is an indication of the ability of the carbide to withstand the sudden temperature changes encountered in brazing, grinding, and metal cutting. The fatigue strength of the material is indicative of its capability of withstanding the chatter encountered in a non-rigid set-up. These three factors show why it is necessary to have good machining conditions when applying carbides to insure satisfactory performance.

#### **Application and Future of Carbides**

The behavior of carbides under impact, thermal shock, and fatigue conditions point out the necessity for continued development in this field.







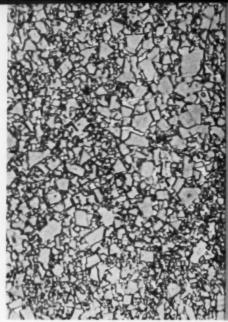


Fig. 2. As in steel, the microstructure of carbide is significant in deciding performance qualities. Although these two grades of carbide have identical compositions, their microstructures vary, thus imparting different properties. The carbide on the left is a general cast-iron grade, while the one on the right is used for roughing steel.

When the machining problems associated with such materials as titanium, Inconel X, and stainless steel are considered, the need for advanced carbide research is further realized.

Inconel X has a relatively small field of application and is therefore machined with standard grades of carbide cutting tools that are ground to suit the application. The material can be successfully machined by using a tool ground with a 15-degree positive side rake, a 45- to 60-degree lead angle, and as small a nose radius as possible to avoid chatter. A speed ranging from 55 to 80 surface feet per minute and a feed ranging from 0.010 to 0.015 inch per revolution are satisfactory and may be used with a 1/4-inch depth of cut

for roughing and a 1/32-inch depth of cut for finishing.

Titanium presents a broad tooling problem because of its growing acceptance for applications where other metals have proved, to say the least, far less satisfactory. Close contact with titanium producers, users, and researchers, has verified the fact that carbides are being employed successfully in all phases of machining this material. Rigidity is essential. In turning, a speed of approximately 100 surface feet per minute, with a feed of 0.016 inch and a depth of cut of 0.100 inch, is recommended. When milling, castiron grades of carbides should be used and the cutter set so that thin chips are produced.



Fig. 3. Production-line drilling of cast-iron engine blocks using carbide-tipped twist drills. Application of these drills increased tool life tenfold.

The chips have been found to be essential to good tool life; therefore, feeds of 0.003 inch per tooch at speeds ranging from 300 to 400 surface feet per minute are advisable.

Although drilling with carbide has been carried out with good results, it is still not a common practice. The switch to carbide from high-speed steel in one case increased the drill life tenfold while maintaining the same speed and feed. Less stock was removed with each tool grind.

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Most carbide drills have been used on cast iron and other materials of good machinability. In Fig. 3, a cast-iron engine block is seen being drilled with carbide-tipped twist drills. The reason for this restricted application is that one grade of carbide is unable to stand up over the wide range of speeds a drill encounters. For example, the center of a drill is running at zero speed while the outer extremities of its cutting lips are running at a speed of 200 surface feet per minute. Therefore, a grade of carbide must be developed that is capable of running from a very low speed at one end to fairly high speeds at the other. This same problem limits the use of carbides in cut-off tools.

Steel can, however, be drilled with carbide quite successfully by resorting to trepanning. As an example of the results of this method, take the case of an 8-foot long steel bar, 6 inches in diameter, through which a 2 1/2-inch diameter hole was to be cut. With conventional techniques, including the use of high-speed steel drills, the job required fifteen hours. When carbide trepanning methods were instituted, the machining time was cut to thirty-six minutes.

Since the modulus of elasticity of carbide is two and one-half to three times that of steel, as already stated, it is desirable for use as a boringbar. This application is illustrated by the line boring of wrist-pin holes in an aluminum piston, Fig. 4. The job previously required simultaneous boring with two spindles. After the carbide boring-bar and cutters were substituted for the standard set-up, only one spindle was necessary, thus eliminating the problem of maintaining alignment between two spindles and substantially increasing production. A typical boring operation using a standard boring-bar equipped with carbide-tipped cutters may be seen in the heading illustration.

Development of new grades of carbide to meet specific requirements is a time-consuming job. A wide demand for the proposed grade is necessary to justify undertaking the challenge. Many tooling bottlenecks can be alleviated through improved tool design alone, thereby permitting a standard grade to be used. It is readily possible to design around the inadequacies of carbide to take advantage of its many desirable properties.



Fig. 4. Carbide boring-bar set up with carbide bits is used to line bore wrist-pin holes. The inherent rigidity of carbide permits close center-line tolerances to be held between the two bores.

An example of how an alteration of cutter design and machine conditions eliminated a difficult tooling problem occurred during the machining of a gasket surface on a tank transmission housing. The job was being done with a twenty-tooth face mill, taking a roughing pass followed by a finishing pass. A tough but not exceptionally wear-resistant grade of carbide was used, and the machine was operated at a low speed and high feed.

By simply changing to a step cutter made up of four single-point tools and installing a fly-wheel on the machine, the pieces per grind were increased to twenty. Each piece was finished in one pass. In addition, regrinding was facilitated since it was necessary to grind only single-point tools rather than a face mill. Furthermore, the speed was increased and the feed reduced, keeping the same time per pass and improving the finish.

To sum up, while the development of carbides has made great strides, there is still much room for improvement. Some problems will be solved through grade development, others through cutter design.

## PREVIEW OF EQUIPMENT

This Section Includes Only Machines and Tools of New or

#### Punch Press Equipped with Automatic Coil Cradle, Slide Feed, and Plain Straightener

A coil cradle with self-contained power drive designed to automatically feed coiled stock to punch presses will be a feature in the exhibit of the U. S. Tool Co., Inc., Dept. M, Ampere (East Orange), N. J. In Fig. 1 is shown the coil cradle set up to feed stock automatically to the plain straightener and slide feed of a punch

press. The straightener and slide feed are also products of the U. S. Tool Co., Inc.

The arrangement of the 1/4-H.P. motor and drive of the automatic coil cradle is shown in Fig. 2. This cradle, designated the Model ACC-1-9-B, has a capacity for feeding material up to 9 inches in width from coils having a maxi-

mum outside diameter of 40 inches. The cradle has two coilsupporting rolls mounted in selfaligning roller bearings, and a pair of hardened and ground powerdriven take-out rolls designed to unwind the material to the very end of the coil. A mercury switch loop-control arrangement starts and stops the motor to provide

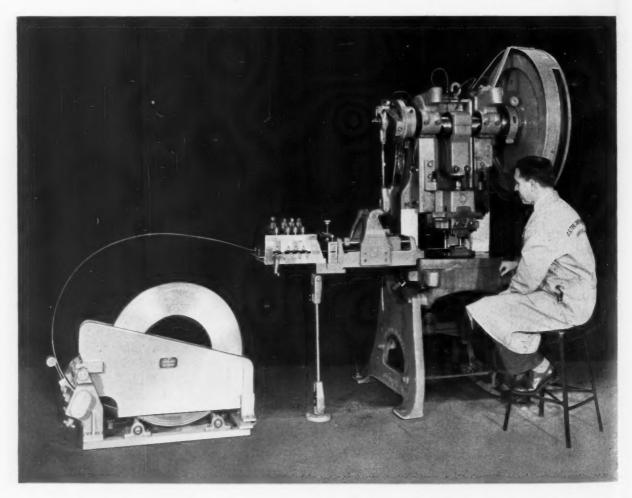


Fig. 1. Press with power-driven coil cradle, slide feed, and straightener made by U.S. Tool Co., Inc.

## TO BE SEEN AT THE SHOW

improved Design that Have not Previously been Described

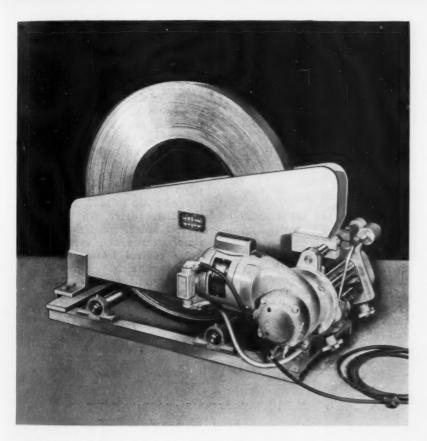


Fig. 2. Rear view of coil cradle, illustrating arrangement of motor drive

feeding rates up to 52 feet per minute. The motor operates on 110-volt single-phase alternating current. The low height of the coil-supporting rolls facilitates loading.

Also included in the company's exhibit will be a slide feed; a plain stock straightener and power-driven straighteners; and a scrap chopper. Booth 1254.

#### Rockwell Drill Unit

The Drill Unit Division of the Rockwell Mfg. Co., Dept. M, 400 N Lexington Ave., Pittsburgh 8,

Pa., will exhibit a modified version of its standard air-hydraulic drill unit. This unit is operated entirely by hydraulic fluid.

The chief advantage of the all-hydraulic operational feature is greater thrust capacity. For example, the thrust of the largest standard air-operated Rockwell unit is increased from 1800 to 6500 pounds when an oil circuit with a pressure of 300 pounds per square inch is used in place of the air pressure system. The company will also display for the first time one of its largest drilling units mounted in a vertical position. Booth 1842.

#### Willey's Diamond Lapping Machine

A Model 60 diamond hand lapping machine developed to produce extremely accurate, keen-cutting edges and a mirror finish on tungsten-carbide tools will be demonstrated by the Willey's Carbide Tool Co., Dept. M, 1342 W. Vernor Highway, Detroit 1, Mich. This machine handles rough-, semi-finish-, and finish-grinding work. It will turn out a large volume of work on a production basis. An 8-inch vitrified wheel is used for rough and semi-finish work, and a 6-inch diamond wheel for finishing. Cool cutting action is insured by a steady flow of coolant, which is force fed by an electrically driven pump mounted within the pedestal. The machine is driven by a 3/4-H.P., heavy-duty ball-bearing motor of the reversible type. Booth 1455.



Lapping machine for finishing tungsten-carbide tools

### PREVIEW OF EQUIPMENT TO BE SEEN AT THE SHOW



Fig. 1. Schwartzkopff vertical boring and milling machine

## Precision Boring, Internal Grinding, and Radial Drilling Machines

The Marac Machinery Corporation, Dept. M, 1819 Broadway, New York 23, N. Y., is introducing three new machine tools. A Schwartzkopff Model No. KBF2 precision vertical boring and milling machine, Fig. 1, features fully automatic hole location. By means of dials, hole positions are preset.

Longitudinal and cross slides of the head adjust themselves to indicated locations, then are automatically clamped. The machine operates from a single lay-out for all distances, speeds, and feeds. Further automation is obtained by adding a punched-card type program director. The Jung internal grinder, Fig. 2, has a new form-dressing attachment that permits the plunge-grinding of dies and internal recesses. Table traverse is variable, with a maximum of 120 strokes per minute. Interchangeable grinding spindles rotate at 35,000 R.P.M. The Raboma radial drilling machine, Fig. 3, has such features as automatic head and column clamps, a hydraulic speed and feed pre-selector, and a feed limit tripping device. Booth 1201.

#### Logan Variable-Speed Lathe

A variable-speed lathe with a swing of 12 inches will be a feature of the exhibit of the Logan Engineering Co., Dept. M, Lawrence and Lamon Aves., Chicago 30. Ill. The timesaving speed correction of the variable-speed transmission and its flexibility in providing continuous optimum speeds is said to assure more efficient operation and reduced production costs. The drive provides a speed range of from 38 to 295 R.P.M. when using the back gears and a range of 250 to 1575 R.P.M. with the direct drive. To obtain the correct speed, the lathe operator simply turns the variable-speed drive control handle while the lathe is running.

Optimum surface speeds can be maintained on large-diameter facing work, by adjusting the spindle speed control handle. There is no



Fig. 2. Jung internal grinding machine

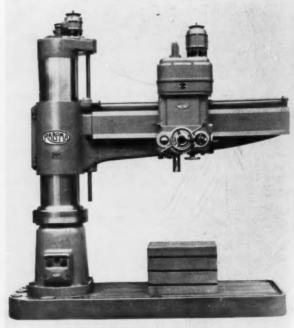


Fig. 3. Raboma radial drilling machine

### PREVIEW OF EQUIPMENT TO BE SEEN AT THE SHOW



Logan lathe equipped with variable-speed drive

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In addition to the model described, new V-belt models of the

Logan standard 10-, 11-, and 12inch swing lathes with up to 1 inch collet capacity will be on display. Booth 908.

#### Osborn Brushamatic for Removing Burrs

New power brushing methods for removing burrs, blending surfaces, and doing other brush finishing jobs on large and heavy work-pieces will be demonstrated at the exposition by the Osborn Mfg. Co., Dept. M, 5401 Hamilton Ave., Cleveland 14, Ohio. A machine for brushing intermediate sizes of work-pieces will be shown

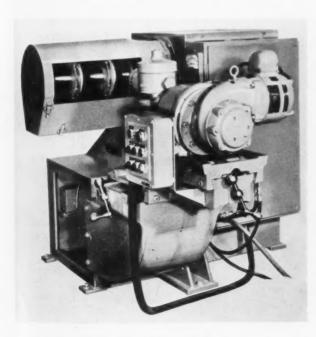
to the metal-working industry for the first time, A Brushamatic 4-L3 machine, another development, is designed to handle metallic or nonmetallic components up to 100 pounds in weight. The work-holder is integral with the brushing lathe, thus providing a fixed relationship between the positions of the brush and the work.

Operation of the 4-L3 machine consists simply of placing the work on the holding fixture, removing it when the brushing is finished, and replacing the finished piece with a new one. A pre-set timer retracts the brushing heads, and motion is stopped until again actuated by the operator. Booth 627

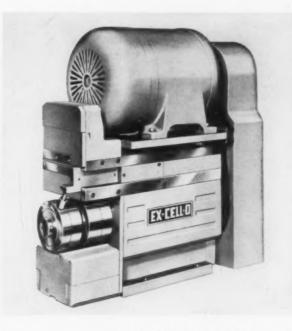
#### Ex-Cell-O Quill Type Power Unit

A quill type hydraulic power unit will be introduced at the show by the Ex-Cell-O Corporation, Dept. M, 1200 Oakman Blvd., Detroit 32, Mich. This Style 22 unit is self-contained, hydraulically operated, and designed for actuating a single tool or a multiple-spindle head in easily controlled automatic cycles. This unit has an 8-inch stroke. A companion unit, Style 22-L, has a 12-inch stroke. The line is adapted for feeding, rotating, and retracting cutting tools.

The Continental Tool Works Division of Ex-Cell-O Corporation will show broaches, and cutting tools classified as standard and



Brushamatic machine for removing burrs from large work



Quill type power unit introduced by Ex-Cell-O Corporation

#### PREVIEW OF EQUIPMENT TO BE SEEN AT THE SHOW

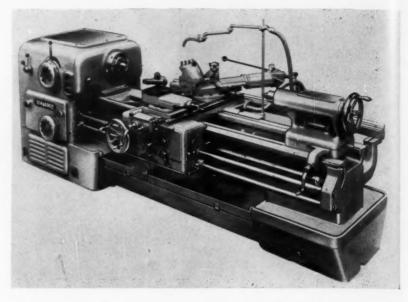
special. Among the standard tools will be the Continental drive counterbores that are engaged or disengaged from the holders with a twist of the wrist. There will be interesting examples of special cutting tools and the work they do, and a wide variety of broaches.

The Precision Products Division will display precision parts and assemblies, ranging from small washers and ball-end pins for piston type aircraft engines to complete compressor rotor assemblies and fuel metering assemblies for gas turbine engines.

#### **Sheldon Tool-Room Lathe**

The Sheldon Machine Co., Inc., Dept. M, 4258 N. Knox Ave., Chicago 41, Ill., will exhibit several products, including their 11-inch precision tool-room lathe. Oversize precision tapered roller bearings support the hardened and ground spindle. A double-wall apron is supplied with powered longitudinal and cross feeds. Leveling adjustments are provided by six set-screws.

With the standard drive, spindle speeds range from 50 to 1355 R.P.M.; higher speeds are available by incorporating different pulleys. This lathe has an 11 1/4-inch swing and a 1-inch collet capacity. Booths 810-812.



Schaerer engine lathe with twin cross-slides and hydro-copying attachment which will be exhibited by the Cosa Corporation

## Engine Lathe with Hydro-Copying, Screw-Cutting, and Taper-Turning Attachments

A Schaerer engine lathe adapted for mass production as well as tool-room turning work is one of the new machines to be exhibited by the Cosa Corporation, Dept. M, Chrysler Bldg., New York 17, N.Y. This lathe is provided with such accessories as twin cross-slides, and hydro-copying, screw-cutting,

and taper-turning attachments.

New features include the preselection of any one of twenty-four speeds, ranging from 9 to 1800 R.P.M., and of fifty-six feeds from 0.001 inch to 0.3125 inch per revolution.

The twin cross-slides have individual cross and longitudinal feeds for both front and rear toolposts. This permits facing and longitudinal turning at the same time. If used with the hydro-copying attachment, the front slide can do roughing work, while the rear slide (guided by a template or master) performs finishing operations. This lathe is made in six sizes.

Among other machines to be exhibited by the Cosa Corporation, are Bechler Swiss automatics; a Deckel universal tool milling and boring machine; a Fortuna cylindrical grinder; a Froriep vertical boring mill; a Kolb jig borer; a Pittler turret lathe; and Rigid-Rorschach hydro-copying milling machines. Booth 1559.

#### Ingersoll-Rand Air-Powered Multiple Nut Runner and Driving Tools

The exhibit of the Ingersoll-Rand Co., Dept. M, Phillipsburg, N. J., will feature "air engineering at work," demonstrating the use of air-powered tools for nutrunning, hammering, fastening, driving, and lifting operations.



Precision tool-room lathe to be exhibited by Sheldon Machine Co., inc.

The central attraction will be an Ingersoll-Rand automatic multiple nutrunner. At the touch of a button, sockets are located on the nuts, and tightened.

When installed and set, a multiple nut-runner provides a completely automatic unit for simultaneously running a number of nuts in the time ordinarily required to run a single nut. The nuts are run to a predetermined stalling point, giving uniform torque control. These tools can be used for such applications as the assembly of automotive engines, transmissions, and differentials; and the manufacture of machine tools, electrical appliances, furniture, and aircraft engines. The illustration shows a nut-runner assembling bearing caps on banjo type carriers. Booth 1835.

# **Precision Equipment for Calibrating Surface Plates**

Equipment developed for rapid, accurate calibrating of surface plates will be exhibited for the first time by the Rahn Granite Surface Plate Co., 637 N. Western Ave., Dayton 7, Ohio. This equipment, consisting of a Rahn black granite straightedge 36 inches long, a pair of 2-inch black granite parallels, and a 0.00005-inch



Air-powered multiple nut runner made by the Ingersoll-Rand Co.

indicator mounted on a special base, can be readily moved to a surface plate. Calibrating takes only a few minutes. Booth 336.

#### Small Press with Heavy Construction Features

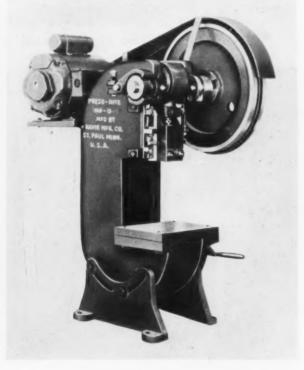
Three new features are announced by the Sales Service Machine Tool Co., Dept. M, 2351 Uni-

versity Ave., St. Paul 14, Minn., for its No. 0 5-ton press in the "Press-Rite" line to be exhibited at the A.S.T.E. Show. All No. 0 machines will have heavy-duty bronze bushings in the flywheel, heavy bronze wear plates in the ram ways, and a new heavy-duty clutch.

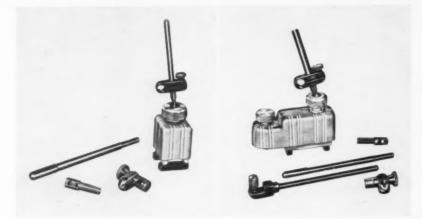
The No. 0 press is the smallest of the line, which covers a capacity range from 5 to 85 tons. Yet it



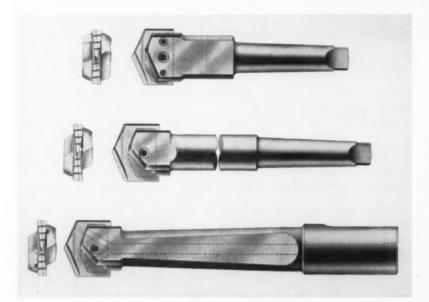
Calibrating surface plate with equipment introduced by the Rahn Granite Surface Plate Co.



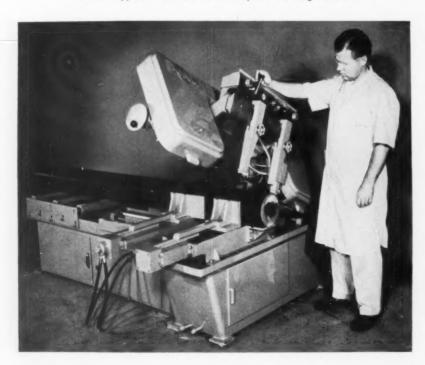
Small press of improved design to be exhibited by the Sales Service Machine Tool Co.



"Tiny-Titan" magnetic bases of plain and precision adjustment types



Conner type drills manufactured by the Gairing Tool Co.



has practically all of the heavy construction features of the large machines, including a cast high-tensile alloy reinforced frame, single-stroke safety mechanism, and a knock-out bar in slide. Other presses of the "Press-Rite" line to be exhibited include machines having capacities of 10, 20, and 30 tons. Booth 1538.

#### "Tiny-Titan" Magnetic Base Indicator and Light Holders

A line of magnetic bases will pull capacities ranging from 65 to 125 pounds will be displayed by the Enco Mfg. Co., Dept. M, 4520-26 W. Fullerton Ave., Chicago 39, Ill. These "Tiny-Titan" bases will be shown with a wide variety of auxiliary equipment. Booth 527.

# Conner Type Spade and Core Drills

The Gairing Tool Co., 21235 Hoover Road, Detroit 32, Mich., is exhibiting its line of Conner type interchangeable spade and core drills. Only eight holders are necessary to accommodate all the cutters, which range in diameter from 1 1/64 to 5 inches. Particularly useful for hard-to-cut material, the spade drills have a relatively small dead center to minimize end pressure, and chipbreaker grooves cut into the lips. Double-angle design of the core drills gives them added precision for straightening eccentric or irregular holes. Holders are available with or without oil-holes. Booth 225.

# DoAll Equipment Developed for Rapid Machining

The DoAll Co., Dept. M, 254 N. Laurel Ave., Des Plaines, Ill., will demonstrate a line of new high-production machining equipment, including automatic surface grinders, and show simplified methods for making precision measurements. Featured will be a "Demon" high-speed steel saw band.

Semi-automatic vertical band machines, designed to obtain maximum performance from the "Demon" saw band, will also be on display. The illustration shows a

DoAll automatic horizontal power band saw

fully automatic horizontal power band saw.

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Tool-room and automatic precision surface grinders will show the possibilities of grinding directly to size by using calibrated feed controls. High-production precision contour or flat grinding jobs will be performed automatically. Booth 1503.

#### **Denison Hydraulic Units**

Recent developments in its complete line of hydraulic equipment will be featured by the Denison Engineering Co., Dept. M, 1152 Dublin Road, Columbus 16, Ohio. New relief valves, axial piston pumps, valve pumps, flow controls, and indexing tables are to be displayed. Booth 1400.

#### Olsen "Electodyne" Balancing Machines

A new type of electronic balancing machine will be exhibited by the Tinius Olsen Testing Machine Co., Dept. M, Easton Road, Willow Grove, Pa. The key feature of this machine is the "Electodyne" electronic system which instantly and automatically indicates on two meters the amount and angular location of unbalance in the work. Horizontal staticdynamic and special automatic vertical static type balancing machines will also be shown at the exhibition. Other Olsen testing equipment, including a new Brinell hardness tester and the 10,000pound LC testing machine, will be on display. Booth 1213.

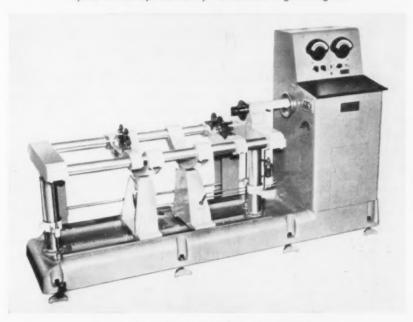
#### **Huge "Red Ring"** Broaches

The National Broach & Machine Co., Dept M, 5600 St. Jean Ave., Detroit 13, Mich., is exhibiting a pair of huge broaches that will soon be used to cut the teeth of internal running gears for automatic transmissions. These gears are claimed to be the largest of their kind ever broached in this country. A 70-inch long roughing broach and a 36-inch long finishing broach complete the gear profile without subsequent finishing operations. The 66-tooth, 14-pitch gear has a major diameter of 5 1/4 inches, and a length of 1 1/4 inches. Booth 1501.

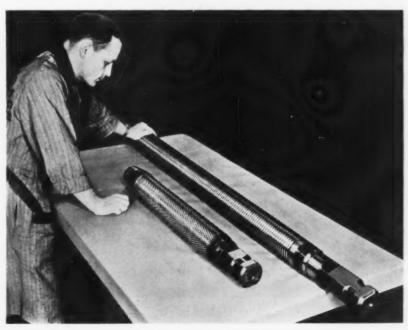
"Red Ring" broaches for large internal gears



Hydraulic units produced by the Denison Engineering Co.



Tinius Olsen "Electodyne" balancing machine.



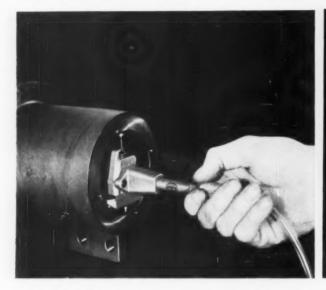






Fig. 2. Balljet adjustable spindle kit with gaging anvils

#### Sheffield Pneumatic and Electronic Gaging Equipment

Among the many new types of precision measuring instruments to be exhibited by the Sheffield Corporation, Dept. M, Dayton 1, Ohio, is the adjustable air bore gage. This lightweight unit, shown in Fig. 1, employs a Plunjet air cartridge as its gaging element. The gage consists essentially of a body, two carbidetipped screws, and four extension and two centering bars having carbide balls as contact points, supplied in a kit. A full range of adjustment from 3 to 12 inches is obtainable.

A Balljet adjustable spindle

kit, shown in Fig. 2, will also be exhibited. The kit contains eight tapered cores, four sets of gaging anvils, a size-setting fixture, a calibrator, four handles, and hoses. Four different gaging spindles, for any size between 1 and 3 inches, may be assembled at one time.

The Precisionaire gage, illustrated in Fig. 3, has been designed for simultaneous inspection of seven different dimensions on automobile pistons. An electronic Leadchek, Fig. 4, has been designed for checking the lead of straight or tapered threads.

This electronic gage can also be employed for checking rack teeth. Booth 325.

#### Improved Acro Coolant System

A redesigned Acro "Lo-Jet" mist coolant system will be introduced by the Air Conversion Research Corporation, Dept. M, 4107 N. Damen Ave., Chicago 18, Ill. The system features a compact master control panel for precise spray regulation. The spray mix control is mounted on top of the unit, and can be connected with flexible tubes of any speci-



Fig. 3. Precisionaire multiple inspection gage



Fig. 4. Electronic Leadchek for gaging threads



Redesigned Acro "Lo-Jet" mist coolant system

fied length so that the control may be moved and installed where desired. Tests prove that with the new unit a fine fog or an actual stream of coolant can be obtained to meet individual job requirements. Booth 1251.

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#### Turret Type Drilling Machine

Howe & Fant, Inc., Dept. M, 26 Fitch St., East Norwalk, Conn., have developed a turret type drilling machine. With this machine one operator is able to perform up to six different drill



Drilling machine with a six-spindle turret built by Howe & Fant, Inc.

press operations, including tapping, at a single location.

A six-spindle turret, featuring a locking-pin drive and mating-taper automatic alignment, is mounted on a single quill. Spindle speed, depth control, and automatic reversal (for tapping) can be individually pre-set for each spindle. Only the spindle in use rotates. The drilling machine has a rated capacity of 1/2 inch in steel. Booth 1967.

#### Beaver Quick-Change Holder

The Beaver Tool & Engineering Corporation, Dept. M, Box 429, Royal Oak, Mich., is showing a quick-change holder designed expressly for machine-tool spin-



Beaver quick-change holder that is adaptable to two-slot spindles

dles having an extra drive keyway through the socket taper. Such a slot permits a cutter to be dislodged without removing the holder itself. Because the location of this extra drive keyway on the socket wall has not been standardized, the corresponding slot in the new holder is extra long, with adapter lugs of various length available to fit the particular machine. The lug is of hardened steel, and its outer edges conform to the taper of the holder shank. Booth 517.

#### Starrett Dial Indicators

The L. S. Starrett Co., Dept. M, Athol, Mass., is introducing its new line of dial indicators at the show. There are 140 models in the line, including regular and "Nonshock" types, with balanced or continuous dials, jeweled or plain bearings, and English or metric graduations in all four standard American Gage Design



Dial indicator being introduced by L. S. Starrett Co.

groups, as well as a complete line of long-range models. Greater accuracy, sensitivity, and longer life have been obtained through a simplified gear train. The count hands of all long-range indicators read directly in decimals, so that no calculations are required to translate revolutions into decimal parts of an inch. Booth 211.

#### Hammond Carbide Tool Grinder

A 6-inch Model D-6 carbide tool grinder designed for dry grinding only is being introduced at the



Carbide tool grinder to be shown by Hammond Machinery Builders, Inc.

show by Hammond Machinery Builders, Inc., Dept. M, 1600 Douglas Ave., Kalamazoo, Mich. Outstanding features incorporated in this machine include a safety disc that completely fills the open cup of the wheel to prevent hand injuries and dropped tools from entering the cup area; exhaust type wheel guards; tables that can be adjusted "in and out" by means of a screw feed to compensate for wheel wear; provisions for quick and easy changing of wheels; and design features that permit two operators to grind tools simultaneously. Booth 1303.

#### Houghton Polar Type Rust Preventative

Rust Veto 1038, developed by E. F. Houghton & Co., Dept. M, 303 W. Lehigh Ave., Philadelphia 33, Pa., is a polar type rust preventative with a greater affinity for metal than water. It displaces the water where soluble-oil mixtures are used, offering short-term protection between operations. The preventative discourages the electrolytic action often encountered between dissimilar metals, thus eliminating pitting and corrosion. Booth 1743.



Reversible plain and thread plug gages made by Size Control Co.

#### Size Control Reversible Plug Gages

The Size Control Co., Dept. M, 2500 W. Washington Blvd., Chicago 12, Ill., will exhibit its complete line of reversible plain and thread plug gages. GO and NOT GO gaging ends are straight for

their entire length, thereby permitting reversal when worn.

By cutting off worn ends, gage life may be appreciably lengthened. The plug members may be inserted as far in or out of the pin-vise type handle as desired, without fear of slippage. Booth 332.

#### Davis Boring Heads, Tool-Holders, and Draw Keys

Many new products are to be exhibited by the Giddings & Lewis Machine Tool Co., Dept. M, Fond du Lac, Wis., among which are boring heads, tool-holders, and ad-

justable draw keys. An adjustable head and a micrometer-controlled boring cutter are two features of the Davis extension type boring heads shown in Fig. 1. The heads

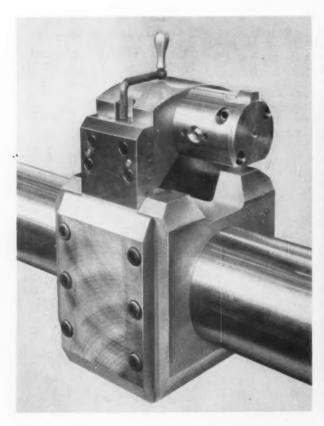


Fig. 1. Davis extension type boring head for large-diameter work, product of Giddings & Lewis Machine Tool Co.

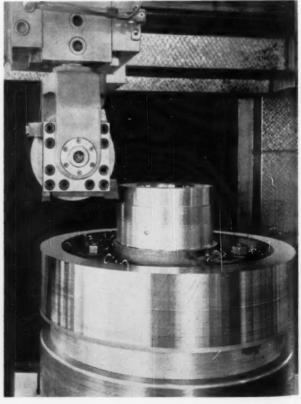


Fig. 2. Tool-changing delays are eliminated by use of the Davis eight-position tool-holder



Fig. 3. Davis adjustable draw key for locking tool shanks in machine spindles

provide interchangeable toolholders which make it possible to bore or face from either the front or back of the head.

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The Davis eight-position toolholders seen in Fig. 2 eliminate tool-changing delay from one cut to another. With a flick of the wrist various cutting tools may be indexed into position.

Davis adjustable draw keys, Fig. 3, positively lock tool shanks in machine spindles with a simple wrench adjustment. The need for a large assortment of solid keys is eliminated. Booth 1500.

#### Automatic Lathe, Radial Drill, and Magnetic Flaw Detector

An automatic copying lathe, a radial drilling machine, and a portable magnetic flaw detector will be exhibited for the first time in this country by H.E.B. Machine Tools, Inc., Dept. M, 475 Fifth Ave., New York 17, N. Y.

The H.E.B. pilot automatic copying lathe shown in Fig. 1 is

a completely automatic machine. Loading and pressing of a button are all the operator must do. The lathe will then take the necessary number of roughing and finishing cuts, after which the spindle stops. The basic machine features a hydraulically operated carriage feed, back tool, and in-

feed slides. Coolant is directed on the work from a nozzle built into the tool-block.

Holes within a 30-inch radius are quickly and easily located, drilled, and tapped with the Constan radial drilling machine seen in Fig. 2. All movements of the drill head are power-operated, including the locking mechanism. Spindle speeds are infinitely variable from 100 to 1680 R.P.M. Simple movement of a lever reduces the speed in the ratio of 4 to 1 for tapping. This machine has a rated capacity of 1 inch in steel for drilling, and 1/2 inch for tapping.

The Sempun portable magnetic flaw detector, which weighs 6 pounds, consists of a central member incorporating a remagnetizing coil; two side links; and two self-setting pole shoe brushes. These brushes make magnetic contact with the work under test. A magnetic force ranging from 200- to 300-oersteds is obtainable. Each flaw detector is supplied with a test specimen containing near-surface flaws as well as deliberate cracks, so that the user can be assured of the effectiveness of the unit. A 6-volt car battery may be used to remagnetize the detector should this become necessary. Booth 509.





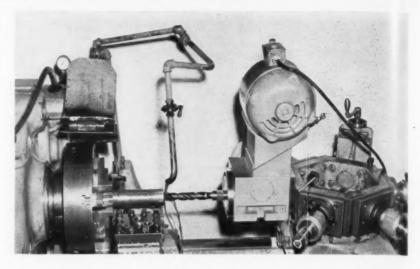
Fig. 1. (Left) Automatic copying lathe and Fig. 2. (Right) Constan radial drilling machine being exhibited by H.E.B. Machine Tools, Inc.

#### Master Lathe and Milling Machine Converters

Attachments that increase the versatility of turret lathes, engine lathes, and milling machines will be on view in the booth of the Master Mfg. Co., Dept. M, 1300 Avenue A, East, Hutchinson, Kans. For turret lathes, a Turret-Master drill head permits the drill as well as the work to revolve, increasing the accuracy of the hole produced. A similar unit, having a vertical spindle, adapts the turret lathe to many milling operations. For horizontal milling machines, the company has available a universal head that permits vertical or angle work to be handled; and for engine lathes, a new, heavyduty milling, boring, and drilling converter. Booth 1454.

# Kaufman Drilling and and Tapping Machines

The Model No. 75DT combination hydraulic drilling and tapping machine shown in Fig. 1 is a prod-



Turret-lathe drill head, a new product of the Master Mfg. Co.

uct of the Kaufman Mfg. Co., Dept. M, Manitowoc, Wis. The machine features a head that can be used as a single-spindle unit or adapted with a multiple-spindle attachment. Accurate tapping is assured by a lead-screw running in a bronze nut under constant lubrication. Other features are a two-directional rapid traverse movement, hydraulically operated clutches, and an integral spindle torque control. A single-head machine of similar construction can be readily converted from a drilling to a tapping unit.

The Model No. 10A tapping machine, Fig. 2, has a multiple-

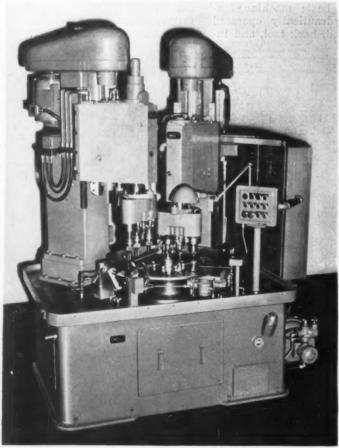


Fig. 1. Kaufman hydraulic drilling and tapping machine

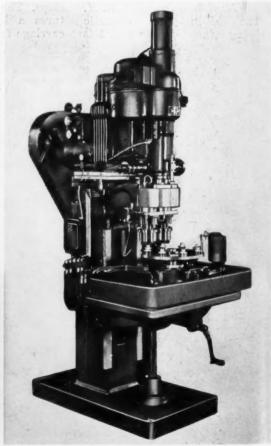


Fig. 2. Multiple-station lead-screw tapping machine

station indexing work dial, and puides the feed of the tap by means of a lead-screw. Except for parts loading and unloading, all functions of the machine are performed automatically. For different jobs, the dial and lead-screw can be quickly changed. Booth 1634.

#### **Double Riveting Machine**

Among the machines to be exhibited by the Chicago Rivet & Machine Co., Dept. M, Bellwood, Ill., will be a new double riveter. This machine rapidly feeds and drives compression rivets in sets consisting of one male and one female rivet. In operation, the tubular rivet is fed and held in a rigid position in the lower (anvil) portion of the machine where it serves as a pilot for the parts to be assembled. The solid rivet is driven from the top to meet the tubular member, thereby forming a strong uniform fastening. Other machines to be shown include single- and multiple-rivet setters as well as a twelve-station indexing fixture used for positioning assembly parts for riveting. Booth 1655.

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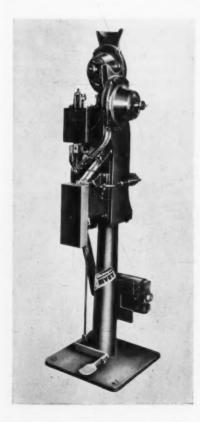
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Compression rivets are fed and driven in sets on this Chicago riveting machine

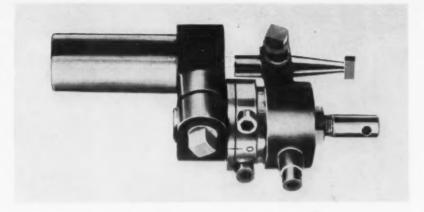


Fig. 1. R and L adjustable recessing tool of improved design that is easier to adjust and more convenient to use

#### Improved Adjustable Recessing Tool

R and L Tools, 1825 Bristol St., Philadelphia 40, Pa., will exhibit their complete line of precision tools for turret lathes and screw

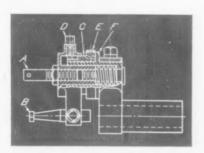


Fig. 2. Drawing of recessing tool. Right- or left-hand operation is obtained by engaging screw (D) in either of two slots in sleeve (C)

machines. Included will be turning tools, carbide and roller backrests, cut-off blade-holders, floating drill-holders, universal toolposts, and revolving stock stops.

One feature will be a recessing tool of improved design, Fig. 1. It can be adjusted to operate on any internal diameter within the capacity of the machine. The tool can also be adjusted to operate on outside diameters for cutting grooves or similar operations, such as chamfering.

Operation of the recessing tool can be clearly understood from the cross-section drawing, Fig. 2. When the spring-loaded, adjustable screw A comes in contact with the cap over the front end of the machine spindle, the hardened and ground, high-speed steel cutting tool B can be adjusted to operate either forward or backward, depending on which

way the operator has set the tool to perform. This is accomplished by means of a fine adjusting sleeve C that has two cam slots, one for left-hand and the other for right-hand operation. Camscrew D can be engaged in either slot by removing the screw and shifting sleeve C, so that screw D enters other slot.

Depth of recess cut and the recess diameter can be finely adjusted by loosening one and tightening the other of two adjusting screws E. A zero reference line, visible in Fig. 1, is engraved on the adjusting sleeve C and intermediate sleeve F to show the operator how much and in which direction the cutting tool has been adjusted. Maximum depth of recess that can be cut is approximately 3/32 to 1/8 inch. The recessing tools are available in three sizes with shank diameters of 5/8, 3/4, and 1 inch. Booth

#### **Oakite Steel Preserver**

A steel preservative will be featured by Oakite Products, Inc., Dept. M, 19 Rector St., New York 6, N. Y. This preservative is a dark brown, heavy-bodied fluid having a flow point of 140 degrees F. The new material has prevented corrosion of steel parts for a minimum of four days in salt-spray tests. If, however, the treated parts are first allowed to dry for twenty-four hours, the exposure time can be doubled. The protective film may be easily removed by immersing the parts in a solution of Oakite alkaline or solvent detergent, followed by a simple water rinse. Booth 1347.

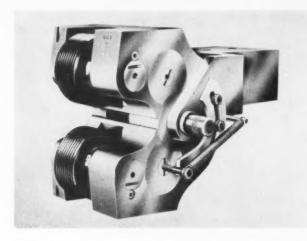


Fig. 1. Landis thread-rolling attachment for automatics

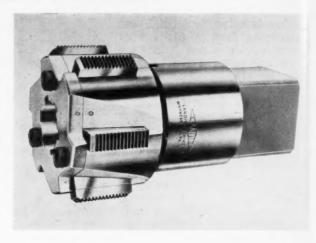


Fig. 2. Solid adjustable tap made by Landis Machine Co.

#### Landis Precision Thread-Rolling Attachment for Automatics and a New Line of Adjustable Taps

Economical thread rolling to Class 4 limits has been made possible by incorporating new principles in the improved "Lanroll" attachment for automatic screw machines shown in Fig. 1. This attachment is being introduced at the show by the Landis Machine Co., Dept. M, Waynesboro, Pa. These principles are said to insure a degree of stabilization between the work-piece and the attachment not previously obtainable in a tool of this type.

The attachment is furnished in two sizes: the No. 18 attachment to permit rolling No. 5-44 to 1/2-13 threads in lengths up to 13/16 inch; and the No. 20 attachment to roll 3/8-24 to 1-8 threads in lengths up to 15/16 inch.

The LSA solid adjustable tap, Fig. 2, will also be exhibited. This tap is designed for high-production tapping on reversing spindle machines. It is rigidly constructed and easy to adjust, permits rapid set-ups, and can be used on automatic screw machines where limited clearance prevents the use of a collapsible tap. Sizes range from 1 1/8 to 8 inches. Booth 1738.

#### H-P-M Line of Components for Hydraulic Systems

An extensive line of hydraulic cylinders, valves, pumps, motors, power units, and accessories will be featured at the show by the Hydraulic Power Division of the Hydraulic Press Mfg. Co., Dept.

M, Mount Gilead, Ohio. Highlights of the display wil<sup>1</sup> include sectional and operative models of the recently announced line of directional and functional valves. These include four-way, two-way, and rotary pilot valves for oil-hydraulic service at pressures up to 3000 pounds per square inch.

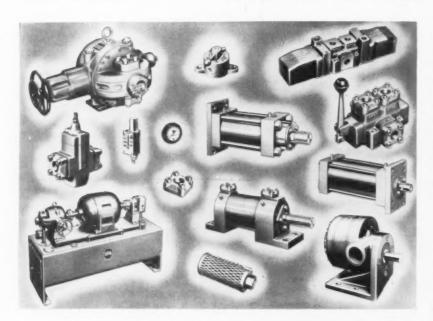
In the functional valve line, a complete new line of pressure controls, flow controls, and check valves for every requirement up to 3000 pounds per square inch will be included. A motion display of standard cylinders and valves, powered by an H-P-M power unit, will demonstrate the new features of this equipment. There will also be cut-away models of H-P-M pumps and motors. Booth 1212.

#### Noble & Westbrook Marking Machine

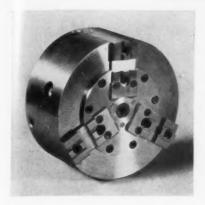
The Noble & Westbrook Co., 15 Westbrook St., East Hartford, Conn., will demonstrate a marking machine having an electropneumatic control circuit. It utilizes the "Noblewest" roll-marking principle. The machine permits semi-automatic, fully automatic, or reciprocating operation. Another marking machine on exhibit employs a twelve-station continuously rotating work-carrier dial. Marking is automatic as the work indexes at the die, Booth 520.

#### **Buck Air Chuck**

A 12-inch Ajust-Tru air chuck is being introduced by the Buck Tool Co., Dept. M, 2015 Schippers Lane, Kalamazoo, Mich. A feature claimed for the device is that soft jaws can be machined on other equipment (so that the



Components for hydraulic systems to be exhibited by H-P-M



Ajust-Tru air chuck, a product of the Buck Tool Co.

chuck need not be taken out of production) without loss of accuracy. The chuck, which is wedge-actuated, will grip work to run within 0.001 inch, and can be adjusted under full line pressure. A working model will be on display. Booth 1635.

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#### Norgren Spray-Lube System for Applying Cutting Oils

The Spray-Lube system designed to permit more efficient utilization of cutting oils and drawing compounds will be introduced by the C. A. Norgren Co., 3419 S. Elati St., Englewood, Colo. This system is said to make it possible to increase cutting feeds and speeds and at the same time prolong tool life. Spray-Lube



Machine equipped with Norgren Spray-Lube system

equipment, as illustrated on the machine, permits the oil spray to be applied to the work area from any direction and to as many points as necessary to thoroughly cover the critical areas of contact between the cutting tools and work. Booth 712.

#### Ames Small-Hole Gage

The B. C. Ames Co., Dept. M, 27 Ames St., Waltham 54, Mass., will present several unique gages designed especially to handle difficult measuring problems, in ad-



Precision small-hole gage that is being introduced by B. C. Ames Co.

dition to the company's complete line of standard micrometer dial indicators and gages. The newly designed two-point contact gage illustrated facilitates quick, accurate inspection of small holes for size, taper, and roundness. Although this gage is extremely sensitive, it automatically centers itself, eliminating the need for "feel" in measuring. Thus, even an unskilled operator can make rapid precise inspections to determine if tolerances are being maintained.

Also featured will be specially designed calipers that provide for exceptional measuring accuracy considering the size and shape of the instruments. Booth 338.

#### Mead Air Cylinders and Valves

Among the products to be exhibited by the Mead Specialties Co., Dept. S-26, 4114 N. Knox



Fig. 1. Mead four-way air valve of 1/2-inch capacity

Ave., Chicago 41, Ill., is a 1/2-inch capacity, four-way air valve, Fig. 1. One end of a double-acting air cylinder (when operated by the valve) is actuated while the opposite end is exhausted. This is accomplished simultaneously by a single movement of the valve lever.

Another four-way fingertip air valve, Fig. 2, gives ample speed of operation for most jobs employing air cylinders with bores up to 3 inches in diameter.

Also being shown are midget single-acting air-clamp cylinders. These units have a 1-inch diameter bore and are manufactured in three standard stroke lengths of 1, 2, and 3 inches. Booth 1907.



Fig. 2. Four-way fingertip air valve brought out by Mead Specialties Co.



Fig. 3. Tiny Mead air-clamp cylinders with a 1-inch diameter bore



Hanson-Whitney internal thread comparator



Heller countersink, lap, and burrs

#### Hanson-Whitney Internal Thread Comparator

A small comparator for rapidly inspecting internal threads is being shown by the Hanson-Whitney Division of Whitney Chain Co., Dept. M, Hartford, Conn. The device is fitted with a pair of segments which correspond to the form and pitch of the internal thread. One of the segments is fixed, and the other is movable. Inserted into the work bore in a collapsed position, the segments are then expanded against the thread. The pitch diameter of the segments in expanded position is compared on a dial indicator to that of a master where range of tolerance is pre-set by two hands on the dial. Diameters from 3/8 to 1 1/2 inches can be checked. Interchangeable truncated segments measure lead angle and form. Booth 414.



Fig. 1. Boyar-Schultz introduces hydraulic surface grinder

#### Heller Countersinks, Laps, and Burrs

"Chatterless" high-speed steel and carbide countersinks can be seen at the booth of the Heller Bros. Co., Dept. M, Newcomerstown, Ohio. An improved tooth design provides a fast shearing cut, producing an exceptionally smooth surface. Also on display are new carbide center laps and internal grinding burrs.



Fig. 2. Knurling and thread rolling tool made by Boyar-Schultz

#### Boyar-Schultz Hydraulic Surface Grinder

The Model 6-18H hydraulic surface grinder, Fig. 1, being unveiled at the A.S.T.E. Show, has been developed by the Boyar-Schultz Corporation, Dept. M, 2110 Walnut St., Chicago 12, Ill. The grinder accommodates a 6- by 18-inch chuck, takes an 8-inch grinding wheel, and has a maximum spindle-to-table distance of 17 inches.

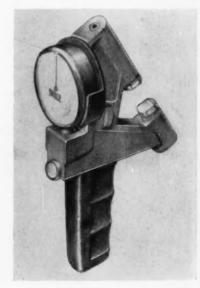
Also being shown is the Model SK knurling and thread rolling tool, Fig. 2, for single-spindle automatic lathes. It is of floating, self-centering construction, designed to compensate for any mis-

alignment in the machine. The tool can be used on either the front or rear cross-slide, and can also be adapted for use on multiple-spindle machines, hand screw machines, and turret lathes.

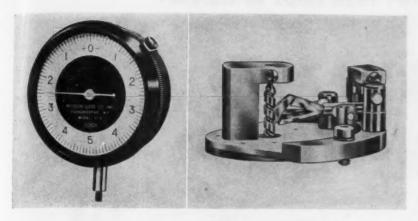
Other Boyar-Schultz products on exhibit are a deep-hole drilling tool and a dust collector. The drilling tool both oscillates and revolves, and can operate to a hole depth of sixteen times the drill diameter without a pull-out. The dust collector is built in the base of the company's Model 6-12 surface grinder. Booth 1809.

#### **Boice Dial Snap Gage**

The Boice Mfg. Co., Inc., Dept. M, Staatsburg, N. Y., is showing a dial snap gage that incorporates flat, parallel anvils which permit measurements close to shoulders. Over-travel of the movable anvil prevents jamming



Boice-designed dial snap gage for measuring close to shoulders



Nilcoid dial indicator with new type mechanism

of the instrument, and a built-in balance reduces operator fatigue. Adjustable masters to set the snap gage, the Setmaster bore gage, and a dial length comparator are also included in the exhibit. Booth 341.

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#### Flexible-Cable Grinder

A hand grinder with variable speeds from 700 to 50,000 R.P.M. is being introduced by the Metal Removal Co., Dept. M, 1546 N. Orleans, Chicago 10, Ill. The grinder, called "Ultra-Flex," is driven by a 1-H.P. three-phase motor. The speed for the flexible drive-shaft is selected by a hand dial. Speeds are accurately maintained even under full load. The grinder will drive carbide burrs, abrasive discs, buffing wheels, and grinding wheels ranging from 1/16 inch to 7 inches in diameter. Booth 1446.



Grinder to be exhibited by the Metal Removal Co.

#### Nilcoid Dial Indicator

The Nilsson Gage Co., Inc., Dept. M, Poughkeepsie, N. Y., will introduce a Nilcoid dial indicator having a mechanism of new design which functions without the usual gear trains and with approximately 50 per cent fewer moving parts. This gage will be available in 1 1/4-, 1 11/16-, and 2 1/4-inch sizes. Booth 202.



"Kleer-Stream" oil recovery unit

#### Oil Recovery Unit

An electrically controlled and operated "Kleer-Stream" automatic oil recovery unit is to be exhibited by the Pioneer Pump Division, Detroit Harvester Co., Dept. M, 2750 Guardian Bldg., Detroit 26, Mich. This unit is designed to recover re-usable oil and assist in reducing stream and lake pollution. It can be readily employed with washers for machine parts, coolant sumps, and reser-

voirs which are used for handling liquids that contain oil.

Although Kleer-Stream units are designed primarily for recovering oil, they can also be used for the separation of other types of liquids with different specific gravities and characteristics which cause them to remain in suspension when mixed. The continuous salvaging operation only requires drawing off the oil when the storage tank is full. The unit is 40 1/2 by 61 1/4 by 12 3/4 inches. Booth 1335.

#### Twist Drill with Heavy Carbide Tips

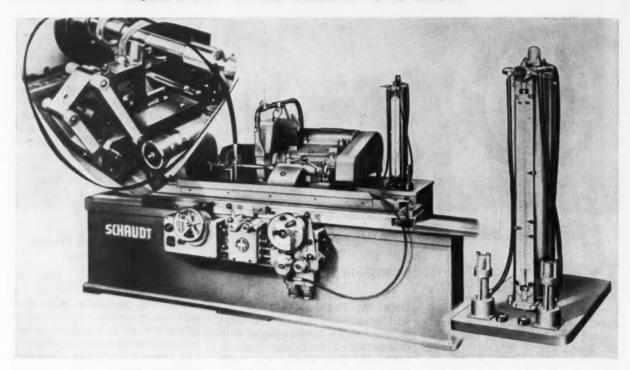
The Super Tool Co., Dept. M, 21650 Hoover Road, Detroit 13, Mich., will include a twist drill with heavy carbide tips in its line of carbide milling cutters, reamers, and similar metal cutting tools. The heavy carbide tips blend into the spiral, radially relieved ground end of the drill which has a heavy web and polished flutes. Booth 628.

#### Hardness Tester with Illuminated Dial

The Wilson Mechanical Instrument Division of the American Chain & Cable Co., Inc., Dept. M, 230 Park Ave., New York 17, N. Y., will demonstrate the latest model hand-operated Rockwell hardness and superficial hardness testers and accessories. A novel feature of the testers is a dial that provides illumination for both the penetrator and test surface. Booth 1802.



Rockwell hand-operated superficial hardness tester



F.g. 1. Schaudt cylindrical grinder to be introduced by the Kurt Orban Co., Inc.

#### Schaudt Cylindrical Grinder and Klingelnberg Gear Tester

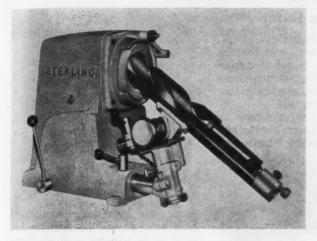
A Schaudt (PSA Ultra) cylindrical grinder, equipped with an automatic sizing control to maintain accuracies within 0.0001 inch, will be shown in operation by the Kurt Orban Co., Inc., Dept. M,

Fig. 2. Klingelnberg gear tester, which will be shown by Kurt Orban

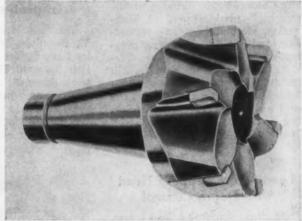
205 E. 42nd St., New York 17, N. Y. The distance between centers on this machine, Fig. 1, is 40 inches and the height of the centers above the ways is 8 1/2 inches. Grinding wheel diameters range up to 29 1/2 inches with a width of 3 1/8 inches. The driving motor has a rating of 16 H.P.

The sizing control can be used in traverse or plunge-cut grinding on work-pieces up to 4 inches in diameter. Operation is fully automatic except for loading and unloading the work. Contact jaws are tungsten carbide-tipped and the lower jaw is hinged to act as a lever. The "Solex" sizing control shown at the right—and a companion type control, the "Etamic," shown at upper left-in Fig. 1, can be supplied on new PSA Ultra machines or can be attached to grinders already in use.

Both cumulative and individual errors on all types of gears can be found and recorded by the Klingelnberg PZ 375 universal gear tester, Fig. 2, also to be exhibited by Kurt Orban. This machine is adaptable both to the two-flank rolling test of various types of gears and to the single-flank test. It records errors in center distances, tooth profiles, base circles, pressure angle, and base pitch of straight spur and helical gears; and circular pitch of gears and hobs. Booth 900.







Nelco taper shank end-mill with cast-alloy body

#### Sterling Drill Grinder

All drills from 1/8 inch to 2 1/2 inches in diameter, having two, three, or four flutes, can be ground without chucks or collets on the bench type Sterling Model DB drill grinder developed by the McDonough Mfg. Co., Dept. M, Eau Claire, Wis. A permanently mounted diamond wheel dresser, accurate scale settings that simplify set-ups, and an arrangement for automatically compensating for wheel wear are other machine features. Booth 2005.

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#### **Brehm Tube Cutter**

A new machine developed by the Brehm Division of the Steel Products Engineering Co., Dept. M, Springfield, Ohio, cuts tubes without loss of stock. It will handle tubes, of almost any material, ranging in diameter from 3/8 inch to 2 inches. Special adapters are available for larger diameters.

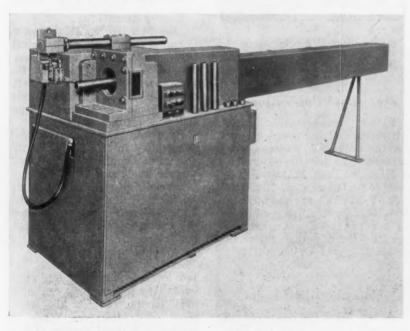
The cutting operation is entirely automatic, the tube being loaded from the front of the machine by sliding it onto a cutting arbor. A carriage then moves the tube into contact with a stop, cutting action takes place, the sheared piece falls into a container, and the tube is again moved forward for the next cutting action. The entire cycle takes about one second, depending upon the length of the piece and the diameter and thickness of the tube. Booth 622.

#### Shell and Face Mills

Nelco carbide tools with new, long-life cast-alloy bodies will be displayed by the Nelco Tool Co., Dept. M, Manchester, Conn. Shell mills, 6- and 8-inch face mills, and No. 50 NMTB taper shank endmills will have the new cast-alloy bodies. Even under grueling use, the new bodies are said to have proved exceptionally tough. For quick identification and rust prevention, the bodies are copper- or cadmium-plated. Booth 1413.

#### Procunier Tapping and Threading Equipment

Unusual tapping operations will be shown by Procunier Safety Chuck Co., Dept. M, 16 S. Clinton



Automatic tube cutter developed by the Steel Products Engineering Co.



Procunier tapping attachment

St., Chicago 6, Ill. Included will be the high-speed tapping of high-carbon steel, and external threading, stud-setting, and tapered plugand screw-setting operations. Visitors to the Procunier booth will be able to run the various machines. Also to be displayed is the new heavy-duty "Tap-King," having a capacity of 1 inch in steel. Booth 1621.

# Lead-Screw Tapping Head with Depth Control

An interchangeable lead-screw, a new type of cone clutch reversing mechanism, and positive depth control are features of the tapping head being introduced by Automatic Methods, Inc., Division 119, 965 W. Grand St., Elizabeth, N. J. Higher production is possible by the "Auto-Tap" head, it is claimed, because the tap withdraws faster. the floating work-piece is positioned rapidly, and operator fatigue is reduced. Also, tap breakage and work spoilage are minimized, since the mechanism is actuated before the tap engages the work. There is no load on the tap other than the normal cutting load. The device can be attached to the quill of any drill press and can be adapted for semi- or fullyautomatic precision tapping. Two models are available-one for No. 0 to 5/16 inch threads, and the other for No. 10 to 3/4 inch threads. Booth 1909.



Tapping head manufactured by Automatic Methods, Inc.

#### Inspection Fixtures

The N. A. Woodworth Co., Dept. M, Ferndale, Mich., will feature its line of "Zero Spindle" inspection fixtures. These devices have been designed to check concentricity and squareness.

When used in conjunction with Woodworth diaphragm chucks and arbors, they check tolerances as



Woodworth fixture that checks concentricity and squareness

close as 0.000025 inch. The fixture assembly is of simple design, consisting of stock items with special templates. Booth 221.



Close-tolerance V-blocks made by the Precision Tool & Mfg. Co.

#### Precision "Uni-V-Blocks"

Parallel and central location within 0.0002 inch are claimed for the universal V-blocks being presented by the Precision Tool & Mfg. Co., Dept. M, 1305 S. Laramie Ave., Cicero 50, Ill. These "Uni-V-Blocks" are made of alloy-steel forgings, later subjected to a deep-freeze treatment that renders them permanently and completely stable. Booth 114.

#### **Unbrako Giant Bolts**

A top display feature of the Standard Pressed Steel Co., Dept. M, Jenkintown, Pa., is to be its



One of a new Unbrako bolt series

new line of Unbrako giant sockethead bolts designed primarily for very large presses and machine tools. These bolts are now stocked in diameters from 1 1/4 to 3 inches and in lengths up to 12 inches. Also being shown is a line of double-life, cold-worked military standard (MS) bolts, and another of lightweight titanium bolts, both for aircraft fabrication. Booth 1539.



Chuck and faceplate jaws made by the Cushman Chuck Co.

#### **Cushman Pinch Type Jaws**

The Cushman Chuck Co., Dept. M, 806 Windsor St., Hartford 2, Conn., is exhibiting its new pinch type chuck and faceplate jaws. Two-piece construction of the jaws permits the use of soft, blank, gripping surfaces that may be machined as required for special work-holding applications.

Each jaw unit has a base that is mounted in the T-slots of the machine table or chuck. This unit carries inside and outside master jaws controlled by an operating screw. The design is such that both jaws may move freely when the operating screw is revolved, but the moment either one of the jaws contacts the work-piece, a "locking" action takes place. The jaw in contact immediately stops while the other jaw continues until it, too, contacts the workpiece. Both jaws may then be tightened without danger of distortion. Booth 1302.



Severance hand file with carbide cutting area

#### Severance Lightweight Hand File

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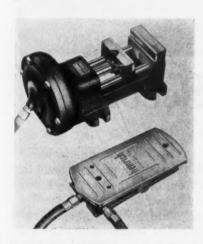
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A lightweight hand file with a carbide cutting area is a feature of the exhibit of Severance Tool Industries, Inc., Dept. M, 636 Iowa St., Saginaw, Mich. The file has been developed for hard or abrasive materials. Three cuts are available—coarse, medium, and fine—each with a carbide cutting area of 3/4 inch by 6 inches. Worn files can be returned to the company for sharpening. Booth 813.



Heinrich air vise and pedal control

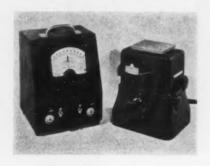
#### Heinrich Air Vise

The Model 33 air vise, manufactured by Heinrich Tools, Inc., Dept. M, Racine, Wis., can grip work with a feather-light touch or with a force fifteen times airline pressure. The vise, controlled by a pedal, has a maximum opening of 3 1/8 inches and a jaw width of 3 inches. The movable jaw slides on a pair of hardened and ground parallel bars. Setting is performed by means of a ratchet-operated triple-thread screw. The vise can be operated from either the shop air line or by a compressor at a maximum pressure of 150 pounds per square inch. Booth 1646.

# Pratt & Whitney Comparator for Small Internal Diameters

A Model D Electrolimit universal comparator is included in the exhibit of Pratt & Whitney Division Niles-Bement-Pond Co., Dept. M, West Hartford 1, Conn. The new instrument accurately checks internal diameters from 1/16 to 1/4 inch, inclusive. A meter with 0.00002-inch calibrations is furnished with the unit.

In operation, two floating fingers are set by gage-blocks the approximate distance apart, then



Pratt & Whitney internal comparator and meter

locked in place. Final adjustment is made through a control knob in the instrument cabinet. Each finger is mounted independently on a gaging head that feeds through two power units to register on the meter. One of the advantages of this design is that it eliminates errors due to stresses imposed on the stationary member of a fixed-finger type gage. Booth 1531.



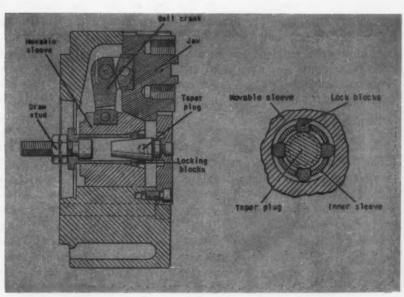
Specialties of the Morton Machine Works

#### Morton Adaptations of Standard Clamps

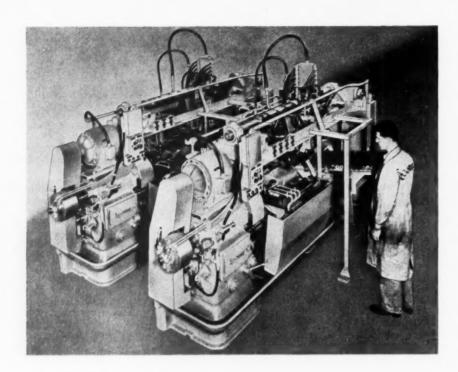
Interesting adaptations of their standard fixture clamps and accessories will highlight the display of the Morton Machine Works, Dept. M, 2421 Wolcott, Detroit 20, Mich. The items include a clamp strap having a pneumatic fiber insert, special rest buttons for the aircraft industry, and special chuck jaws. Booth 113.

#### **Logan Locking Chuck**

The Logansport Machine Co., Dept. M, Logansport, Ind., will demonstrate its new P.R.O. (power release only) chuck. This chuck will remain locked in the closed position until positively opened by the operator. Neither centrifugal force nor power failure will cause the chuck to release as it revolves on the machine spindle. Gripping action is produced by the wedging action of a set of locking blocks as they are forced between a tapered plug and a movable sleeve member. Booth 1550.



Positive locking chuck placed on the market by Logansport Machine Co.



# **Unique Mechanism Reloads Camshafts in Nine Seconds**

E QUIPMENT applied to two Lo-swing lathes unloads and loads the machines, transfers the camshafts from one machine to the other, and inspects all machined surfaces for dimensional accuracy. During the transfer of the camshafts from the first to the second machine, they are turned end for end, as the two lathes are tooled up to machine surfaces on the opposite ends of the camshafts. All machine movements are coordinated by an electric control panel. Safety and quality control devices instantly detect and single out any work-pieces that are not machined within specified tolerances. The machine that is producing off-size work is stopped immediately when this occurs.

The reloading time for each machine is only nine seconds and the machining time, thirty seconds. The two machines complete with the work-handling and transferring equipment were recently demonstrated in operation at the plant of the Seneca Falls Machine Co., Seneca Falls, N. Y., builder of the entire unit.

Compactness of the equipment is an advantage that will be apparent from the heading illustration, which shows the loading side of the first machine. It is intended that the machine be installed in a continuous production line and that the camshafts be brought to the first machine on an inclined gravity conveyor.

The outstanding feature of each machine is the transfer carrier unit which effects the loading and unloading of the camshafts. This carrier is actuated back and forth along the machine, as required, by means of followers that engage a helical groove on a drum cam at the top of the machine. Each carrier has two slides mounted on inclined surfaces at the front and back of the main carrier member. A loader arm is attached to the front side and an unloader arm to the rear slide. These arms may be seen at *A* and *B*, Fig. 2.

This illustration shows the transfer carrier at the tailstock end of the first machine, positioned over the station where the work is picked up and discharged. A semi-finished camshaft C previously taken from between the centers of the lathe has been dropped by the unloader arm into a turntable cradle, while a rough camshaft has been injected into the fingers of the loader arm and clamped, ready for placing in the machine.

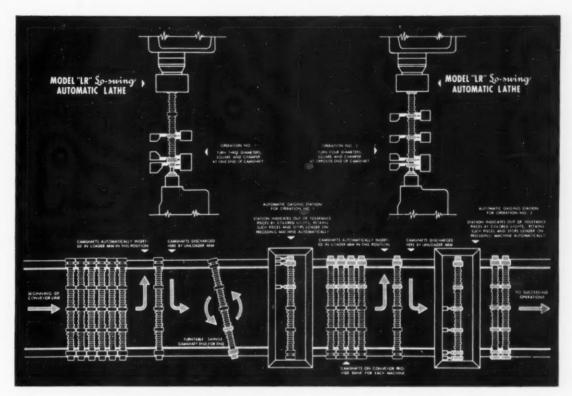


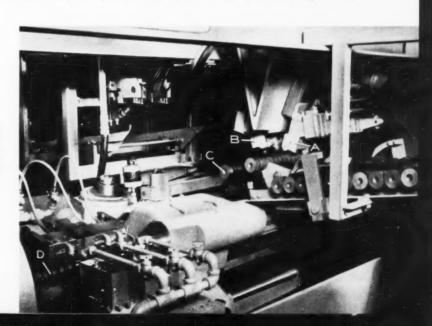
Fig. 1. Successive steps in transferring camshafts to two Lo-swing automatic lathes and and to gaging stations that follow each machine operation, the camshafts being finally discharged to the conveyor line, ready for successive operations

The camshaft seen at D is in the process of being machined.

The transfer carrier has advanced to the reloading position in Fig. 3, over the centers of the lathe. A rough camshaft A is held by the fingers of the loader arm, ready to be placed in the machine immediately after the semi-finished piece is removed. This part is held between centers, as shown at *B*, although the front and rear tool-slides have been retracted from the work. The headstock spindle has stopped revolving and the chuck jaws have opened.

In Fig. 4, the transfer carrier is still stationed in the reloading position but the unloader arm has moved down and clamped the semi-finished part, as seen at *B*. Also the tailstock spindle con-

Fig. 2. The work transfer carrier is seen positioned over the conveyor at the point where the semi-finished camshaft is discharged by the unloader arm of the first machine and a rough camshaft picked up by the loader arm.



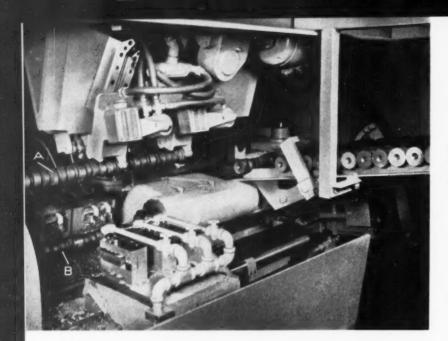


Fig. 3. The transfer carrier in position above the machine centers, a rough camshaft being held by the loader arm while the unloader arm is ready to descend and pick up the semi-finished camshaft

tinues to hold the work between centers and the rough camshaft is held in the loader fingers at A.

The tailstock spindle has retracted in Fig. 5 and the semi-finished piece *B* has been removed from between the centers of the lathe, being held in the raised position by the unloader arm. The fingers of this arm have, of course, been clamped on the camshaft. The loader arm has injected the rough camshaft *A* between the lathe centers. The loader fingers are still clamped on the piece, ready to release it when the tailstock spindle advances.

In Fig. 6, the rough camshaft is seen between the centers of the lathe, the driving chuck jaws

having closed and the headstock spindle clutch having been engaged to start the machining cycle. The transfer carrier has returned to the discharging and loading positions over the conveyor line. The semi-finished part has been dropped on the turntable cradle, as seen at C, and the latter has started to reverse the piece end for end before delivering it to the gaging unit. A rough part has again been injected into the loader arm at A.

The gaging unit for one of the machines is shown in Fig. 7 with a camshaft on the cradle of an air-operated elevator *E* ready to be raised into the gage assembly. The gages will control

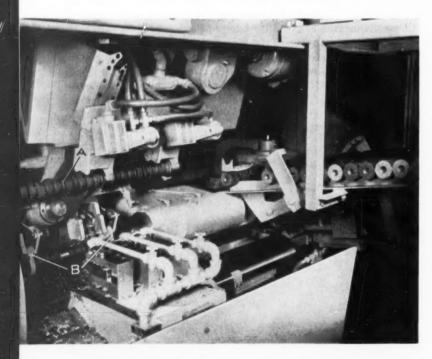
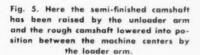
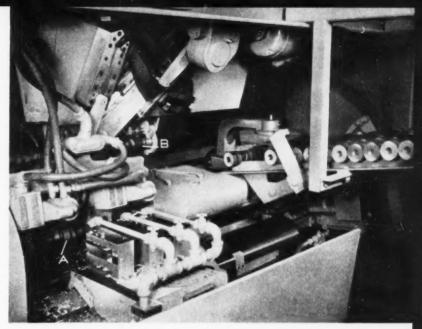


Fig. 4. The fingers of the unloader arm are clamped on the semi-finished camshaft, and the loader arm is ready to lower the rough camshaft into position as soon as the semi-finished camshaft has been removed.





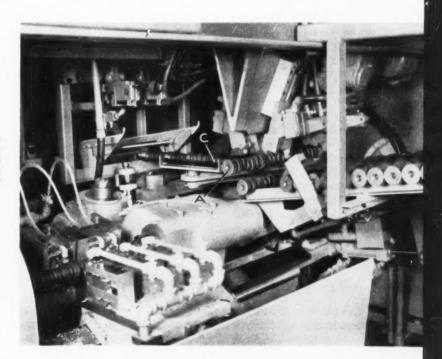
camshafts either under or over size as little as 0.0002 inch, although the gaging heads may be adjusted to change the tolerances. The gages are electrically operated and indicate by means of green, red, and blackout lights, respectively, whether the points of inspection are over size, under size, or within the tolerance.

When diameters are within the specified tolerances, the camshaft is automatically released from the gaging station and deposited on the conveyor rails for delivery either to the second machine or from the complete unit, as the case may be. If the work-piece is either over or under size, it remains in the gaging position. The ma-

chine that turned the rejected camshaft stops automatically at the end of the cycle. The tool setter can then change the cutting tool that was signaled as being at fault by the respective light in the gaging unit. The off-tolerance piece is next released from the gaging station by operating a push-button, after which the master control switch button is depressed to again start the machine on its automatic cycle.

In the first operation, as indicated in Fig. 1, three camshaft surfaces are turned and faced, and a chamfer is cut at one end of the camshaft. Four surfaces are turned and faced by the tools of the second automatic lathe, and a

Fig. 6. The transfer carrier again seen at the starting position of the cycle, the semi-finished camshaft just removed from the machine being shown on the turntable which swivels the work end for end for the second operation.



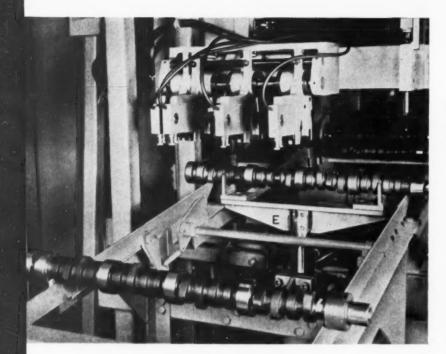


Fig. 7. One of the electric gaging units which indicates specifically by panel lights any camshaft surfaces that have been turned either over or under size.

chamfer is cut on the opposite end of the camshaft.

The two machines are spaced far enough apart to permit easy access to the second lathe for tool changing, and also to allow for a bank of twenty camshafts to be accumulated on the conveyor line between the two machines. This bank of camshafts is important because it provides for shutting down only one machine at a time for tool replacement.

Advantages claimed for this completely automatic camshaft machining equipment include the elimination of operator fatigue due to mechanical handling; the reduction of labor and unit costs because of the automatically controlled machining and handling time; improved quality control as a result of the automatic gaging provision; and reduction in work spoilage and salvage expense. Fewer operators are required for a production line and the damage to camshafts incident to hand loading operations is eliminated. Final advantages to be mentioned are a reduction of accidents due to removal of the human element and simplification of plant lay-outs because of the straight-line conveyor feed and discharge lines.

#### Nickel in Earth's Crust

Scientists have estimated that the earth's crust contains approximately twice as much nickel as copper, zinc, and lead combined.

#### A New Book for the Heating and Ventilating Engineer

FLOW AND FAN. By C. Harold Berry. 232 pages, 5 1/8 by 8 1/2 inches; 84 illustrations. Published by The Industrial Press, 148 Lafayette St., New York 13, N. Y. Price \$4.

The how and why of basic calculations in the design of systems for moving air or other gases are thoroughly covered by the author, who is the Gordon McKay Professor of Mechanical Engineering at Harvard University. The text meets the needs of students who are interested in acquiring a working knowledge of ventilation, and it also serves as a reference volume for the practical engineer.

There are two major divisions of treatment: (1) the flow of gas through duct systems; and (2) fan performance and control. In the seven chapters on gas flow, basic methods are presented for finding system resistance. The final six chapters are devoted to the practical task of selecting a fan for a given duty.

The text is presented in a most readable style and the arrangement of topics is particularly suited where the material must serve readers with varied technical backgrounds. Subjects covered include gas flow measurement, head, density, pressure, boiler draft, losses in laminar and turbulent flow through various shapes of duct, fan types and performance, fan selection, and model testing. Technical information not elsewhere available is developed fully.

# **Electromechanical Spot-Drilling**

# Reduces Costs

By RAYMOND H. SPIOTTA Assistant Editor



THE great amount of time consumed in the exacting work of laying out holes in chassis plates and similar components of instrument assemblies led to the development by the Hillyer Instrument Co., Inc., New York City, of a revolutionary type of electromechanical machine. With this equipment, operations that formerly took as long as two hours twelve minutes can now be accomplished in the short time of eleven minutes.

In applying this machine, which is shown in Fig. 1, the operator locates the plate to be drilled on the work-table and locks it in place, then dials the center-line dimensions by means of selector knobs on a separate control panel, much the same as a channel would be selected on a television receiver. By eliminating the need for continually reading finely graduated precision measuring instruments, and by removing the necessity for center-punching locating points for accurately positioned holes, the ever-present factor of human error is virtually eliminated.

This comparatively lightweight unit, tipping the scales at approximately 300 pounds, has been designed primarily for spot-drilling. It consists of two major components: a remote-controlled drilling machine A, and a control-selector panel B. The control panel is small and easily portable. Three cables are connected to it—one goes to the drill head C, and the other two

feed electric signals to the longitudinal and lateral control mechanisms, D and E, respectively, of the drilling unit. A source of 110-volt alternating current is all that is required to operate the machine.

A system of color coding is used to reduce operator fatigue and to prevent consequential errors. The left-hand half of the control panel shown in Fig. 2 is basically orange, and contains four selector knobs F. This color denotes the controls for the "width" dimension of the hole to be drilled. These controls transmit the information to the lateral servo mechanism on the drilling unit. A yellow background is provided for the four selector knobs G controlling the "length" dimension of the hole. Information pertaining to this dimension is fed to the longitudinal servo mechanism of the drilling machine.

Six additional control switches appear on the panel: the main power switch H, two forward and two reverse switches J, and a drilling selector switch K. The forward and reverse switches control the direction of initial movement of the drill head. "Forward" is a movement either laterally or longitudinally away from the starting point of the coordinates, while "reverse" is just the opposite.

These switches are mainly timesavers. For example, after a hole has been dialed and spot-drilled, a second hole location should be dialed.

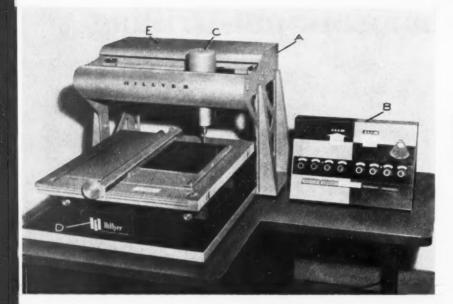


Fig. 1. Lightweight drilling machine at left is remotely controlled by portable control-selector panel at right. Locating dimensions dialed on the control panel are converted to positive mechanical movements by two servo mechanisms.

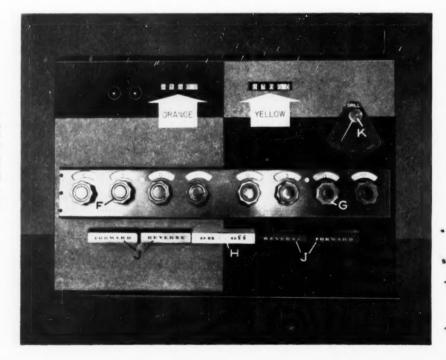
If the distance of this second hole from either locating surface is less than the corresponding distance of the preceding hole, the reverse lever for that direction should be activated. The drill head would then back up to the new location. If, however, the forward lever were to be depressed, the drill head would move away from the second hole until it reached its limit of travel, whereupon it would reverse itself and come back to the correct location.

The machine is small and compact, occupying

a space 36 inches wide by 42 inches deep (51 inches with the table at its rearmost position). It is suited to tool-room use for spot-drilling templates, and also to job-lot production. Workpieces up to 20 by 20 inches in size can be accommodated and, by reversing the part, a maximum size of 20 by 40 inches can be handled.

Hole locations are obtained by an in-and-out movement of the work-table together with a transverse movement of the drill head. The table is supported on each side by two pairs of ball

Fig. 2. Dimensions dialed on selector knobs may be viewed in windows on each half of control panel over the arrows. Red and green signal lights are located in the upper left-hand corner of panel. The red light is illuminated while the drilling machine is sensing a location, but changes to green when the drill head has positioned itself.



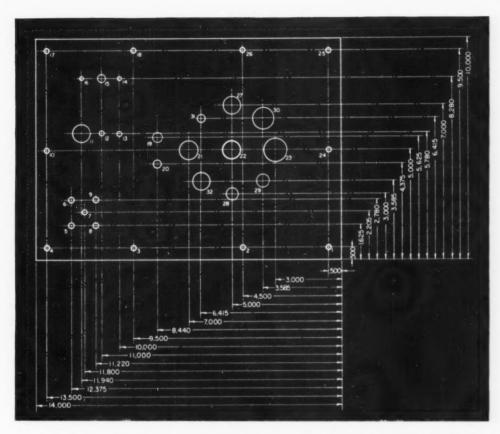


Fig. 3. Plates like this one may be spot-drilled in a fraction of the time it would normally take to lay out and center-punch them. This is accomplished by the machine shown in Fig. 1.

bearings mounted to form a vee. Centerless ground rods provide tracks on which the bearings roll. This design eliminates a great deal of friction, thus allowing the table to be moved accurately with the slightest impulse. A servo unit is mounted directly beneath the table. Integral with the servo mechanism is a push-pull rod that is secured to the under side of the worktable. Thus every movement of the servo is accurately transmitted to the work.

A standard Dumore unit, serving as the drill head, is secured to a horizontal mounting plate. Through this mounting plate pass two centerless ground shafts on which the unit travels. Located directly behind the drill head, and in the same plane with it, is the transverse servo unit. Motion is transmitted from the servo to the mounted drill unit by means of a spring-loaded phosphor-bronze cable. The purpose of the spring is to take up any slack by keeping the cable under tension at all times.

The basic construction of the two servo units is identical. They are, in fact, interchangeable with the exception of the linkage. The two units function independently, each being driven by an Oster 1/30-H.P. electric motor.

Alternating-current relays, micro switches, a differential driving mechanism, a fiber-glass base printed circuit, and the electric motor comprise the basic components of each servo unit. The units convert the selected dimensions into positive mechanical movements by means of the motor-driven differential which, in turn, drives a lead-screw. A carriage on the lead-screw is attached to either a push-pull rod, for controlling the table, or a phosphor-bronze cable for the drill head, as the application demands.

A typical job involving the spot-drilling of numerous holes in plate stock is illustrated in Fig. 3. As the first and only step before drilling, it is convenient to resolve all center-line dimensions into X and Y coordinates and list them in the form of a chart. Page 1 of the chart for this particular job is reproduced in Fig. 4. There are five columns on the chart: the first specifies the individual hole number as designated on the blueprint; the second and fourth columns represent the distance of each hole from its respective locating surfaces; and the third and fifth columns indicate whether to press the forward lever, reverse lever, or none at all. A sketch of the work-piece at the top center of the chart

assures that the plate will be correctly positioned on the work-table.

The duties of the operator are extremely simple. He merely positions the work against a side rail and a locating pin on the machine table, after which the work is clamped in place by means of a built-in locking bar. The corner at which the two locating edges meet is the point from which all dimensions are taken. In the example given, the lower right-hand corner was chosen as the zero coordinate point. The machine can be set up, however, with this point at any other corner.

Following the lay-out data on the chart for hole No. 1, the operator dials 0.500 on the left-hand, or orange, side of the control panel, and 0.500 on the right-hand, or yellow, side of the panel. Upon depressing the forward levers on both halves of the panel, the drill head and the table locate themselves accurately (within 0.002 inch) for the particular hole. When the drill selector switch is set to the "auto" position, the drill head feeds the center drill into the work in the same cycle.

For drilling hole No. 2, the yellow selectors

are simply dialed to 4.500. When the forward lever for this dimension is depressed, the drill head moves to its new location, center-drills the hole, and retracts. While the actual drilling is going on, the operator starts to dial the next location. The plate shown in Fig. 3 may be seen being drilled in the heading illustration.

Application of this machine is not restricted to sheet and plate stock exclusively. Small castings may also be accommodated. There is a fixture for holding rings so that holes can be spotted around a circular path. (Note: This spotdrilling machine may be seen in Booth 2107 at the A.S.T.E. Show.)

#### Carbide Tools Have Longer Life in Sawing Plastics

Tungsten-carbide cutting tools are outwearing high-speed steel tools by more than 3 to 1 on plastic machining operations at the Switchgear Department of General Electric Co. in Philadelphia, Pa. Problems were encountered in

cutting wood-, fiber-, and synthetic-based plastics of various thicknesses. On 3/8-inch thick Celifron plastic, for example, only 800 feet could be cut with high-speed steel tools. With Carboloy carbide-tipped saws, however, more than 25,000 feet can be cut before the saw teeth have to be sharpened. The plastic cutting operation is performed with a 14- or 16-inch diameter circular saw rotating at 3600 R.P.M. The 14-inch saw has ninety carbide teeth, while the 16-inch saw has ninety-six.

The differential between cutting abilities of high-speed steel and carbide is even more pronounced on other thicknesses. On the 3/4-inch material, for example, 6 feet of material is the upper limit that can be cut with steel. Over 10,000 feet can be machined with carbides. This applies to most plastic compounds. When using a new machine that also cuts aluminum, the Department averages over 10,000 feet per grind with carbides.

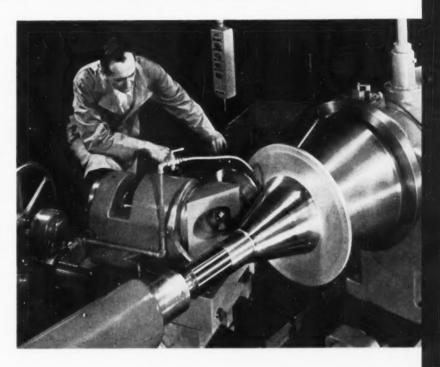
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2	.500	0	4.500	F	
3	,500	0	9,500	F	
4	,500	0	13,500	F	
. 5	1.625	F/	12.375	R	
6	21760	F	12.375	/0	
7	2.205	R	11.800	R	
8	1.625	R	11.220	R	
9	2.760	F	11.220	0	
10	5,000	F	13,500	F	
11	5,780	F	11.940	R	
12	5,780	0	11,000	R.	
13	5.780	0	10,000	R	
14	8,280	F	10,000	0	
15	6,280	0	11,000	F	
16	6,280	0	11.940	F	
17	9.500	F	13,500		
18	9,500	0	9,500	R	
19	5.625	P.	8.440	R	
20	4.375	R	8.440	0	
21	5.000	F	7,000	R	
22	5,000	0	5.000	12	
23	5,000	0	3,000	R	
24	5.000	0	,500	R	
25	9,500	F	.500	0	

Fig. 4. Lay-out data chart drawn up for the plate shown in Fig. 3. This chart identifies each hole, lists its X and Y coordinates, and indicates whether to depress the forward or reverse lever, or neither.

# Floturn — A New Method of

# **Forming** Metal

Metal is caused to flow in a cold state to the shape of a mandrel in this fast, economical process that saves costly material. Starting with a metal blank, forging. welded cylinder, or centrifugal casting, parts of conical, cylindrical, and other shapes can be quickly and accurately produced



LOTURN is a revolutionary process of forming metal that has just been announced by the Lodge & Shipley Co., Cincinnati, Ohio. With this new technique, metal is quickly and accurately cold-flowed to the shape of a mandrel-which can be of conical, cylindrical, or complex shape.

Cold-flow turning—as this method has been appropriately termed—is performed on Lodge & Shipley Floturn lathes, such as the one seen in the heading illustration. At the beginning of an operation, the work may consist of a plain or machined blank, machined forging, drawn cup, wrapped and welded cylinder, or a centrifugal casting. It is secured to the desired shape mandrel, or clamped between the hydraulically operated ram of the tailstock and the mandrel.

The work-piece and the mandrel are rotated by the headstock spindle, and a hardened and polished steel roller (mounted on an independent carriage and rotated by friction as it contacts the work) is power-fed parallel to the periphery of the mandrel. The great pressure applied by the roller under carefully controlled conditions, and in a continuous spiral manner, causes the metal to flow in a cold state to the shape of the mandrel.

Although similar in some respects to the centuries-old art of spinning, the Floturn process is an entirely new technique. In conventional spinning, the blank employed is considerably larger in diameter than that of the finished piece. With the majority of spun parts, the thickness of the metal blank used is fairly uniform throughout, and differs little from that of the finished part. With cold-flow turning, the diameter of the blank is exactly that of the finished part, as illustrated in Fig. 1. The blank thickness is considerably greater than that required for the finished wall—the additional metal being displaced and flowed into the extended shape as determined by the mandrel shape and roller pressure. Hollow parts with drastic changes of wall thickness can be produced in this way.

Also, spinning is essentially a manual art requiring hand tools and craftsmen having considerable skill and experience. As a result, spun parts often lack uniformity, and production is slow. In cold-flow turning, the process is completely a machine operation, requiring no particular skill from the operator. All pieces are uniform, dimensions can be held to plus or minus 0.002 inch, and production is high. Flanges reguired on a part can be made the same thickness as the original blank, or thinner.

Cold-flow turning has already been widely tested, and is in use in aircraft jet-engine production where important time- and cost-saving

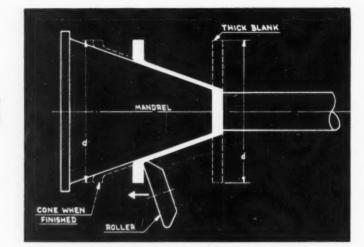


Fig. 1. In Floturn process, diameter of blank does not change as roller coldflows metal blank to shape of mandrel on lathe spindle.

applications are possible. New alloys, including many that are difficult to machine, are easily worked by the method. Metals that have been successfully formed in this way include 300 and 400 series stainless steels, Timken 16-25-6 and 17-22-5 heat-resistant alloys, Haynes Multimet, Universal Cyclops Uniloy, Inconel and Inconel X, Monel and K-Monel, T1-140-A titanium alloy, copper, aluminum, and mild steel. In the harder metals, blanks up to 5/16 inch in thickness can be worked and, in the softer metals, blanks up to 1/2 inch in thickness.

A group of typical parts formed by the Floturn process is shown in Fig. 2. Parts ranging in size from a few inches in diameter to cones and cylindrical pieces used with the largest aircraft jet engines have been formed successfully. The jet-engine exhaust cone seen at left in Fig. 3

was cold-flow turned from the 21-inch square, AMS 5510 stainless-steel blank shown at the right. The thickness of the original blank was 0.095 inch, and that of the finished part, 0.027 inch plus or minus 0.002 inch.

Another example of Floturn work is illustrated in Fig. 4. The press-formed cup seen at the left is often the best shaped piece for forming taper cones with this process. The stainless-steel cone at the right, having a wall thickness of 0.032 inch, was cold-flow turned from the 0.156-inch thick wall cup in two passes.

Sections cut from a sample piece that started as a flat forged blank are shown in Fig 5. The variations in thickness of this part are clearly visible. Savings are possible in materials and machining by substituting "Floturned" parts for components formerly made from forgings.

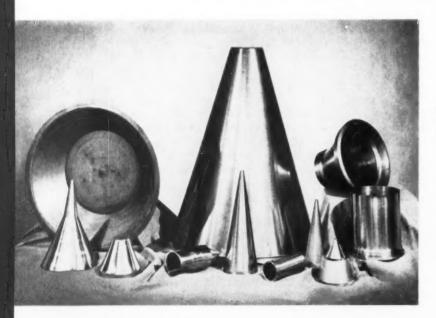
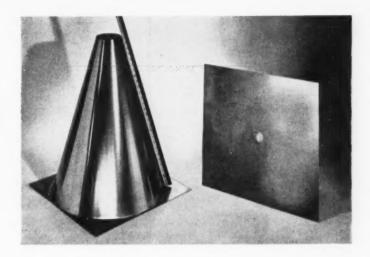


Fig. 2. Group of typical parts formed by the Floturn process. Conical, cylindrical, and other shaped parts are accurately produced.

Fig. 3. Jet-engine exhaust cone (left) was cold-flow turned from a 21-inch square stainless-steel blank, the thickness having been reduced from 0.095 to 0.027 inch.





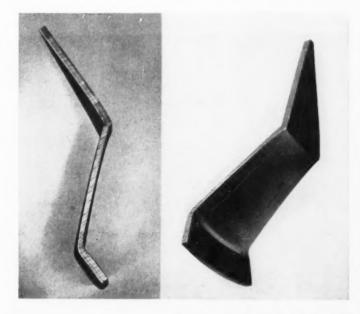
For example, a finished part weighing 50 pounds was originally made from a forging weighing 369 pounds and costing \$276.75. Now, the same finished part is cold-flow turned from a blank weighing 65 pounds and costing \$48.75. The saving in material cost alone is \$228—or 82.5 per cent.

Another outstanding advantage of the Floturn process is that the strength and hardness of the metal are increased by cold-working. For example, in cold-flow turning 302 stainless steel, tests showed that the tensile strength of the material was increased as much as 100 per cent. Even after stress-relieving, the increase still amounted to about 40 per cent. Hardness increased from that in the cold-rolled annealed state to about 58 on the Rockwell 30-N scale.

Floturn tooling is relatively low in cost and has a long life. In most cases, the part can be

Fig. 4. (Above) Press-formed cups, such as the one seen at left, are most suitable blanks for "Floturning" parts having a gradual taper.

Fig. 5. (Right) Sections cut from a sample piece that was cold-flow turned from a flat forged blank. Note variations in thickness of this part.



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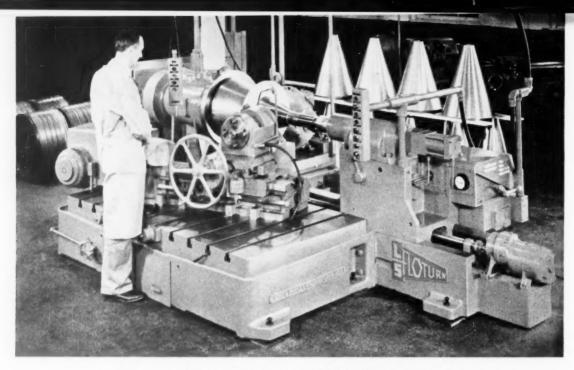


Fig. 6. Floturn lathe that will handle work 42 inches in diameter by 50 inches long. In softer metals, blanks up to 1/2 inch thick can be worked.

produced directly to finished dimensions, except for trimming allowances. In other cases, where extreme precision is necessary, from 0.015 to 0.020 inch can be left on the surfaces of the cold-flow turned part for subsequent removal.

At present, Lodge & Shipley has marketed two sizes of Floturn lathes. One size handles work 42 inches in diameter by 24 inches long, while the other, Fig. 6, can form parts 42 inches in diameter by 50 inches long. The headstock spindles are rotated by direct-current motors, powered by variable-speed drive units that provide infinitely variable spindle speeds from 33 to 1000 R.P.M.

Each machine is equipped with a hydraulically operated tailstock for clamping the workpiece against the mandrel. The forming roll is mounted on an independent cross-slide that is arranged to be power-fed along the ways of a carriage, Fig. 7. Pick-off gears are provided to vary the feed rate from 1/4 inch to 9 inches per minute. Two hand-operated screws are provided for pivoting the carriage on its bed, so that the roll can be fed parallel to the peripheries of various shaped mandrels. The large handwheel seen at the lower left is used to set the roller with relation to the mandrel at the start of the cycle, and to back off the roll after forming.

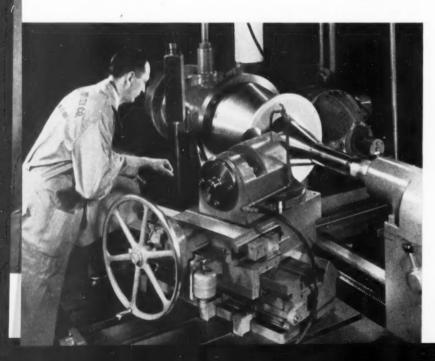


Fig. 7. Blank clamped between tailstock ram and mandrel is cold-flowed along mandrel by roller that is power-fed parallel to periphery of mandrel.

# Heavy-Duty Tooling for Cold Extrusion of Steel

(Continued from page 175)

that such a hesitation might produce a slight work-hardening of the part which would lead to an increase in the peak loading of the press and also have an adverse effect on the life of the punch.

When hydraulic presses are used, economy demands a fast approach speed and a slower working speed of the ram. Provisions for overcoming hesitation require increased capacity of the pumping equipment and rapid dissipation of pressure energy at the end of the working stroke. In addition, the pumping equipment must be arranged to deliver oil at maximum pressure for a longer period during the press cycle than is customary. With conventional press usage, peak oil pressure is necessary for a much shorter portion of the ram stroke.

#### Suitability of Mechanical Presses for Cold Extrusion of Steel

Mechanical presses are also suitable for cold extrusion. When this type of press is used, only one-fourth to one-fifth of the total ram travel should be apportioned for the extrusion operation to avoid undue strain on the press mechanism due to side thrust. The dynamic stresses imposed upon the tools and the press, rather than considerations of rate of metal flow, tend to restrict the operating speed.

When a mechanical press equipped with overhead driving gear was used, the ratio of the crank, or eccentric, throw to the length of the connecting-rod was made as large as possible. If impact occurred 30 degrees or more before reaching bottom dead center of the ram, a large proportion of the pressing force was transmitted horizontally to the uprights. Great lateral rigidity is necessary in the construction of these members, in order to withstand the forces imposed.

A comparison was made between the maximum pressure needed to produce a certain part by deep-drawing and by extrusion. The work-piece was a cylindrical cup 1 1/2 inches in diameter by 4 inches deep, with a wall thickness of 0.22 inch. It was made of deep-drawing steel with a carbon content of 0.15 per cent. Whereas deep-drawing demanded a pressure of 17 tons, punch loads of 100 tons for the last 2 inches and 500 tons for the last 1/2 inch of stroke were required for cold extrusion.

Stability of the ram is the utmost importance under these conditions. Ram-guiding members of

considerable length are essential. Exceptionally heavy driving units are also necessary. It is not unusual for an extrusion press with a rating of 1500 tons to be fitted with a driving mechanism comparable to that for a 4500-ton press that has been designed to handle conventional types of operations.

# Proper Lubrication is Essential to Success of Cold Extrusion

Adequate lubrication of the work-piece being extruded is essential. Zinc-phosphate surface treatment plays a vital part in the successful operation of the cold-extrusion process. Advantages claimed for this treatment include its capability as a carrier for lubricant in addition to its inherent lubricating properties. Exhaustive tests have been performed using manganese, cadmium, calcium, and barium phosphates. None of these treatments proved as effective as the zinc-phosphating process.

Provided that the zinc-phosphate coating is uniform, strongly adherent to the metal surface, and correctly lubricated, the thickness of the coating is the most important factor affecting its behavior during the forming operation. Due to the difficulty of measuring this thickness, the weight per square foot of the coating is the generally accepted criterion.

Soap solutions, together with fatty acids such as tallow or rape oil, have given the best results. Actual use has shown that sulphonated tallow is very efficient, with iard oil containing 15 per cent free fatty acid running close behind. The lubricant is usually applied by immersion. Immersion time has an influence on the degree of permeation of the phosphate coating and consequently on the reduction of friction during the extrusion operation.

A typical sequence of operations for the surface treatment of a part to be extruded is as follows: Clean; rinse in cold running water; acid pickle; rinse in cold running water; rinse in hot running water; zinc-phosphate coat; rinse in cold running water; rinse (hot conditioning); lubricate; and, finally, dry. Alkali cleaners are suitable for the initial operation. Trichlorethylene can also be used, in which case the first cold water rinse should be eliminated. Cold hydrochloric or hot sulphuric acids may be used for pickling. Some form of mechanized equipment should be employed for efficient pre-extrusion treatment.

# Machine Tool Distributors Hold Spring Meeting

THE American Machine Tool Distributors' Association held its thirtieth spring meeting at the Boca Raton Hotel and Club, Boca Raton, Fla., on March 3 and 4. Members attended from all over the country, as far west as Seattle.

The meeting was opened Wednesday morning by the president of the Association, Thomas R. Rudel, Rudel Machinery Co., New York City, and started with reports by various committee chairmen. In the general session, R. L. Giebel, Giebel, Inc., New York City, presented a paper entitled "A Machine Tool Distributor's Deliberations," in which he stated that the machine tool distributor's success depends on his general knowledge of hard goods manufacturing methods; his skill in anticipating trends; his capacity to consistently produce a sales volume which will satisfy all his manufacturers and earn a profit for himself; and his ability to make and retain friends.

The distributor must keep the good will of his customers, according to Mr. Giebel, and be of service to them year in and year out whether they buy or not. "Good will" is the distributor's capital investment. It cannot be bought, sold, or exchanged. It can, however, be lost. Of importance is a well-organized, capable engineering department—one that can give and accept advice on design and production problems and render prompt installation and maintenance service. "Satisfactory installations," he said, "are the life blood of both manufacturer and distributor."

Speaking on the subject of training specialists for the sales force of both distributor and manufacturer, Mr. Giebel stated that specialists do not remain such unless they are called back to the factory for systematic refresher courses.

Mr. Giebel also pointed out that sales costs do not increase or decrease in direct proportion to the selling price. The distributor knows that the greater the competition the more sales expense is involved. No matter how well a machine is designed and made, or how attractively it is priced, it will require much sales effort before it is accepted in the trade as equal or better than a competing machine which has proved its worth.

The biggest job is to sell the capitalistic system to everyone with whom the sales engineers come in contact. Because their job is to find ways and means to produce faster, better, and cheaper, the continuous results of their efforts are to create more efficient use of labor. When costs are

cut, selling prices are reduced. Therefore, more and more customers can afford to buy. As mass buying develops, other services are required, resulting in an endless chain of opportunities for employment. The machine tool industry is the cornerstone of the free enterprise system. Machine tools are capital at work. They are as essential as guns, tanks, and planes in a modern war. Progressive countries and healthy machine tool industries are inseparable.

Charles F. Honeywell, Administrator of the Business and Defense Services Administration, United States Department of Commerce, stressed that the aim of his division is service to business. Its policy is not to do anything for industry that industry can do for itself; neither will it plead a businessman's case, but it will help him in every way to plead his own case. Mr. Honeywell predicted that shipments of machine tools this year would total \$1,000,000,000 compared with \$1,200,000,000 in 1953. His estimate was based on the assumption that the Defense Department will spend \$250,000,000 on machine tools in 1954.

The dinner speaker was Kenneth McFarland, educational consultant and lecturer, General Motors Corporation, Topeka, Kans. Dr. McFarland expressed the thought that the secret of being a good businessman lies within the man in expressing qualities that draw others to him. To be a successful salesman, a tradesman, a foreman, or a manager, you primarily need to be the man first, before you become a man in particular. The success of a businessman is fundamentally based on a sincere desire to serve others, and to apply the Golden Rule.

Speakers at the Thursday morning session included Joel Barlow, Covington & Burling, Washington, D. C., who spoke on procurement policy, accelerated amortization, and tax developments, and Tell Berna, General Manager, National Machine Tool Builders' Association, whose comments covered many subjects of interest to the distributors, such as the government machine tool leasing program, the status of the export and import machine tool business, and plans for the forthcoming Machine Tool Show in Chicago. Securing new machine tool business today, he stressed, calls for improving and strengthening sales technique, and selling industry on the economy of modernizing its plants by getting rid of obsolete equipment.



# The Sales Engineer and His Problems

By BERNARD LESTER Management Consulting Engineer New York

# Selling the Why of Machine Replacement

VERY manufacturer ought to be awake to on such good fortune as adding new products or E the benefits of equipment replacement but how can he be sold on the idea? This question deserves a reply more explicit than that of the southern negro preacher when asked how he saved so many souls by his sermons. His answer was, "Fust I tell 'um what I'se goin' to tell 'um. Then I tells 'um. And then I tells 'um what I told 'um."

The best sales approach to any businessman running a factory is to show ways and means of improving product quality and increasing production with less ultimate expense. Many manufacturers, particularly smaller ones, still regard the buying of machinery as an expense—a last resort to keep going—rather than as a necessary and welcome opportunity to decrease loss and increase profit. They retain old familiar tools that have served well just as we affectionately hang on to an old hat to wear when we work in the garden or go fishing.

If, in our daily round of visits to prospects and customers, we can change the attitude of factory management toward old equipment, we will expand our market to a remarkable degree. In an age marked by an appeal to the senses, management's attention is particularly receptive to new-fangled gadgets that improve the appearance and conveniences of the factory. What so often escapes business executives are fundamental cost-reducing ideas that are outside the realm of habitual thinking. Our economy today calls for wise and careful spending, rather than saving and guarding property of shrinking usefulness. Selling the desirability of adopting a replacement policy strikes at the very foundation of what makes factories "tick."

The following questions can be useful in an approach to management:

1. Where will your company be in the competitive market five or ten years from now?

It is remarkable how few company managers seriously consider an intelligent answer to this question. Most managers discount the element of time and the inroads it can make upon a growing business. They are inclined to rest their hopes hanging on to old established customers. They overlook the instability of those elements that have yielded past success. They are habitually unconscious of the fact that values in physical equipment decrease day by day. They disregard two general forces that are constantly working against present efficiency-wear and tear of installed equipment, and obsolescence of present equipment.

One big job in selling the necessity of a replacement policy is to brush away management cobwebs, and kindle thoughts to the reality that values fade by the hour, month, and year.

2. Do you know what your present equipment is actually worth?

Management is far too inclined to figure equipment values in terms of what equipment originally cost. Past dollars applied to depreciation, on the average, are worth less than half their original amount in terms of new equipment and, anyway, companies seldom set aside the money that has been applied to depreciation.

Management ordinarily does not realize that the charge-off expense for a given machine continues after the zero point is reached. The machine keeps building up a liability obligation, because it is a profit leak involving unnecessary and expensive man-hours, space, and overhead.

What factory manager cramped for space would carry in his warehouse a supply of worthless material? Yet he willingly continues to use an obsolete machine whose operation is even more cost-consuming.

3. How can you decrease manufacturing costs in the face of a constant mark-up in the price tag of man-hours and material?

Disregard for mounting expenses resulting from the use of obsolete equipment is often a blind spot in management's vision. It is a chief cause of waste and an insidious opiate that generates false self-satisfaction. Plant management constantly complains of the increased cost and decreased effectiveness of man-hours. Not frequently enough do they reach a solution through the use of new equipment.

# LATEST DEVELOPMENTS IN



#### Pratt & Whitney Hydraulic Vertical Surface Grinder

An improved 14-inch hydraulic vertical surface grinder of more rigid design and with higher table speeds than any preceding model has been announced by Pratt & Whitney Division Niles-Bement-Pond Co., Dept. M, West Hartford 1, Conn. This machine, designated Model D, is available in a 14- by 36-inch or 14- by 60-inch size with

solid ring-wheel, or a 17- by 36-inch or 17- by 60-inch size with segmental wheel.

The increased length and depth of the heavily ribbed bed of the machine give greater support to the table and column. Wider wheel-head ways together with an increase in the column bearing length provide the spindle head

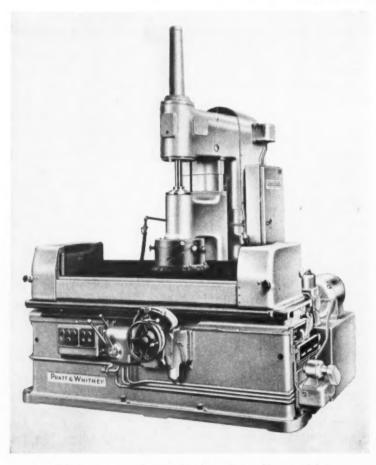
with additional support. The spindle is made heavier with more rigid bearing construction and the wheel flange is an integral part of the spindle. Approximately a 25 per cent increase in the weight of the grinder has resulted because of this new design.

Higher table speeds that are infinitely variable and uniform from 2 to 100 feet per minute permit the use of much harder, longer lasting wheels, thus lowering wheel costs and providing grinding speeds for almost any material.

The table traverse is operated by two hydraulic cylinders. Speed is controlled by metering the oil in the return lines — surge, creep, and coasting being completely eliminated. The hydraulic system consists of a 50-gallon reservoir equipped with a 30-gallon per minute delivery pump having an automatic control that meters the flow according to the speed desired giving greater efficiency.

Power is provided by a 30-H.P. motor, but a 40-H.P. motor is also available. Direct gear connection to the spindle is of simple, rugged design. Full power is transmitted smoothly to the wheel through specially developed spiral bevel gears of hardened nickel steel that run in oil.

Other features of the grinder include positive lubrication to the table ways by a continuous automatic pressure system having visual glass "check points" in each line; general lubrication by a "one shot" lubricator; and an indicator mounted on the spindle which gives a constant power reading that shows overloading. The Model D machine meets J.I.C. standards both electrically and hydraulically. Centralized controls, convenient to the operator's reach, minimize fatigue.



Pratt & Whitney hydraulic vertical surface grinder of improved design

# Machine tools, unit mechanisms, machine parts, and material-handling appliances recently placed on market

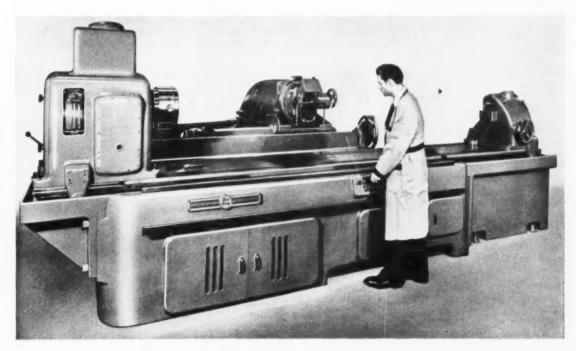
Edited by Freeman C. Duston

#### Horizontal Gear-Shaving Machine

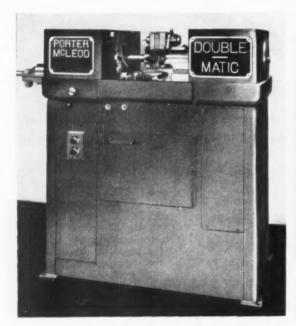
A "Red Ring" horizontal gearshaving machine for finishing teeth on spur and helical gears having pitch diameters up to 36 inches and shafts up to 142 inches in length is announced by the National Broach & Machine Co., Dept. M, 5600 St. Jean Ave., Detroit 13, Mich. This Model GCJ-36 machine has a power-driven headstock and a center tailstock. Gears up to 2 diametral pitch and having face widths up to 36 inches can be finished. The machine will crown tooth surfaces on spur and helical gears up to 12 inches wide having shafts up to 62 inches long. Gear and shaft assemblies can be mounted on centers or on a flexible type work driver that enables them to be shaved while rotating on the journals of the machine on which they are to be used.

Gear tooth surfaces are finished by the crossed axes principle, the gear being rotated in mesh with and driving the gear-shaving cutter. The latter has its axis crossed with respect to the gear axis. The serrated-tooth cutter is traversed back and forth across the gear tooth face while being fed in selective increments to a depth that will produce the desired tooth size. Cutters 9 and 12 inches in diameter are ordinarily used. Crowning of gears is accomplished simultaneously with the shaving operation by automatically rocking the work as the cutter reciprocates across it. The table is locked when crowning is not desired.

A 5-H.P. motor drives the headstock through a worm-gear and change-gears. The cross-feed for the cutter-slide is power-driven by a 3-H.P. motor through reduction gearing, change-gears, and a leadscrew and nut arrangement. Two speeds are provided by this drive—one for traverse and one for feed. A 1/4-H.P. motor drives the coolant pump. The machine is 213 inches long, 113 inches deep, 75 inches high overall, and weighs approximately 42,000 pounds.



"Red Ring" gear-shaving machine for spur and helical gears having shafts up to 142 inches long





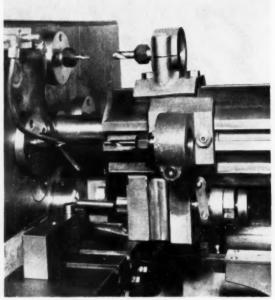


Fig. 2. Close-up of Double-Matic tool equipment

#### Porter-McLeod Double-Matic Screw Machine

The Porter-McLeod Machine Tool Co., Inc., Dept. M. Hatfield, Mass., will display at the A.S.T.E. Show (Booth 2060) a Double-Matic screw machine which performs operations on both the front and back ends of work-pieces in one complete cycle. This machine, Fig. 1, completely eliminates the need for second operation machines by performing additional work after the part is cut off.

The Double-Matic utilizes a tool-holding turret revolving on an axis parallel to the spindle. As with other screw machines, the stock is fed through the spindle, clamped, and machined on the front side. However, the final turret position is occupied by a live spindle-shown opposite the headstock spindle in Fig. 2. The live spindle contains a collet and runs at the same speed as the maindrive spindle. This live spindle grips the work-piece, supports it during the cut-off operation, and continues to hold it. Then, while turret tools machine the next piece, the back end is machined by tools on the headstock.

Almost any operation—reaming, drilling, tapping, threading, forming, or chamfering—can be performed as easily on the back as on the front end of the work. The machine supports the turret rigidly at both headstock and tail-

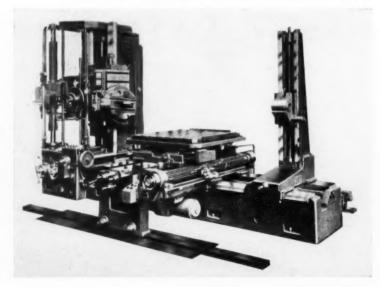
stock ends to permit heavy forming cuts. It has an independent indexing mechanism.

Work capacity is up to 1 inch in diameter and 4 1/2 inches in length. Spindle speeds range from 400 to 6000 R.P.M. The 3-H.P. motor has a speed of 1800 R.P.M.

#### **Boring Mill that Needs No Jigs**

Accurate hole locations without jigs are possible on the Ceruti "Alematic" boring mills introduced in this country by the Kennedy Corporation, Dept. M, 1620

Dime Bldg., Detroit 26, Mich. The head and cross-slide movements are controlled by a series of micrometric dogs set on drums. During the slow approach to the



Ceruti horizontal boring mill being marketed by Kennedy Corporation







Fig. 2. VMA universal shaper to be exhibited at A.S.T.E. show by the Austin Industrial Corporation

dogs, the vertical and horizontal slides are hydraulically operated.

Slides are moved and clamped by means of push-buttons. Verniers or dial gages and rods are used to set the position of the dogs on the drums. The manufacturer claims that the machine is accurate within 0.0004 inch. Two sizes of boring mills are available— 3 1/8 and 3 9/16 inches.

#### Sajo Milling Machine and VMA Shaper

The Sajo all-geared universal milling machine, Fig. 1, the VMA 26-inch universal shaper, Fig. 2, and the Sajo hydraulic hacksaw, Fig. 3, will be exhibited in this country for the first time at the A.S.T.E. Show by the Austin Industrial Corporation, Dept. M. Box 430, 76 Mamaroneck Ave.,

White Plains, N. Y., Booth 1334. A Prema Model 02 shaper will also be included in the exhibit.

The universal milling machine, Model UF-54, has a 7 1/2-H.P. motor drive to the spindle and a 1 1/2-H.P. table feed and rapidtraverse motor. There are sixteen spindle speeds ranging from 39 to 1500 R.P.M. An optional range of 31 to 1200 R.P.M. is available. The power feed and rapid traverse movements have a longitudinal range of 33 1/2 inches, transverse range of 10 inches, and vertical range of 18 inches. The table is 48 by 11 inches. Features include dial selection of speeds and feeds, a start-stop-brake lever, and provision for climb-milling.

The universal shaper, Model ES, has a 7 1/2-H.P. main drive motor and a 1-H.P. table rapid traverse motor. Features include a double helical-tooth crank gear, an automatic forced feed lubrication system, and hardened chromium nickel gears that run in an oil bath.

Centralized controls, a cutting pressure governor, an eccentric feed-in roller, and a simplified hydraulic system are features of the hydraulic hacksaw, Model RC-250. This hacksaw has a cutting capacity of 10 by 10 inches, and is equipped with a 2-H.P. motor.



Fig. 3. Sajo hydraulic hacksaw, on exhibit at the Tool Engineers Show

#### Raytheon Ultrasonic Machine

An ultrasonic machine tool developed by the Raytheon Mfg. Co., Dept. M, Waltham 54, Mass., for cutting the hardest materials will be in operation at the A.S.T.E. Show, Booth 2101. With this machine, ultrasonic energy can be applied for abrasive machining of such hard substances as carbides, hardened steel, ceramics, glass, quartz, and even gems. Inexpensive commercial abrasives in liquid suspension are used in the cutting of intricate shapes in hard, brittle materials. An important feature of this machine is its capacity for machining square, triangular, and irregular-shaped

A specially designed magnetostrictive transducer, vibrating at approximately 25,000 times per second, produces the cutting action by driving the abrasive particles at such high speed that they strike the work with forces equivalent to 5000 to 10,000 times their normal weight. The machine is especially adapted for shaping and finishing tungsten-carbide dies of all types, ceramic spacers, cameo and intaglio in semi-precious stones or glass, quartz ferrite, and other materials.

Cutting speeds vary with operating conditions, but a typical rate for cutting tungsten carbide with a tool 3/8 inch in diameter, for instance, is 0.01 inch per minute, while glass may be cut at the rate of 0.2 inch per minute. The device is supplied complete with electronic power supply, a transducer (magnetostrictive unit) that drives the cutting tool, a supporting stand, a work-holder, and an abrasive circulating system.

#### Black & Webster Solenoid-Operated Electropunch

Black & Webster, Inc., Dept. M, 445 Watertown St., Newton 58, Mass., are introducing a low-cost



Ultrasonic machine for cutting hard materials developed by Raytheon Mfg. Co.

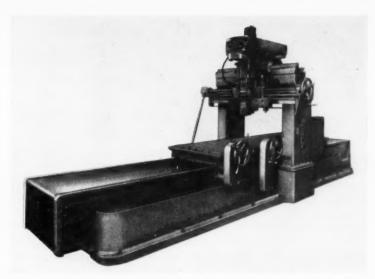


Black & Webster Electropunch

Electropunch at the A.S.T.E. Show. This solenoid-operated Model F Electropunch has an open-back, C-frame designed to facilitate the use of a hopper or automatic feed. The solenoid and ram are fixed as to height above the base. The punch delivers uniform impacts or blows that are adjustable from a few ounces to 3500 pounds, at speeds up to 125 blows a minute. It is suitable for staking, marking, swaging, punching, and other high-speed production operations. Because of its low cost, manufacturers can afford to keep this impact hammer set up for a specific job.

Features of this punch include interchangeable tooling with inexpensive tool blanks. The punch or staking blank is made of drill rod 1 inch in diameter with a turned shank 1/2 inch in diameter that fits directly into the spindle hole. The bolster plate, or locating tool blank, is made from a cast-iron slug 3 inches in diameter with a turned 3/4-inch shank that fits into the base-pad hole. This simplified tooling feature permits inexperienced operators to set up the press.

The Electropunch operates on the electromagnetic principle from any 115-volt alternating-current line. It is offered with two impact ratings: 2000 pounds (Model FH); and 3500 pounds (Model FS). The unit is 20 inches high, weighs 50 pounds, and has a base 9 1/2 by 9 inches. Throat depth is 5 inches, and shut height 3 1/4 inches.



Morey "Aeroframe" profile-milling machine

#### Morey Profile-Milling Machine

machine, profile-milling known as the No. 50 M "Aeroframe," is now being built by the Morey Machinery Co., Inc., 383 Lafayette St., New York 3, N. Y. This is a rigid machine designed for milling and profiling irregular-shaped, complicated precision parts, such as airframes, castiron frames for computing and typesetting machines, printing presses, and forgings for aircraft parts. It can be used for mass production as well as for machining single pieces.

The wide range of speeds, 125 to 4600 R.P.M., adapts this machine for use in machining practically any material. The spindle is provided with a No. 50 standard taper. The machine is equipped with a two-speed vertical motor delivering 7 1/2 H.P. at 1800 R.P.M. and 15 H.P. at 3600 R.P.M.

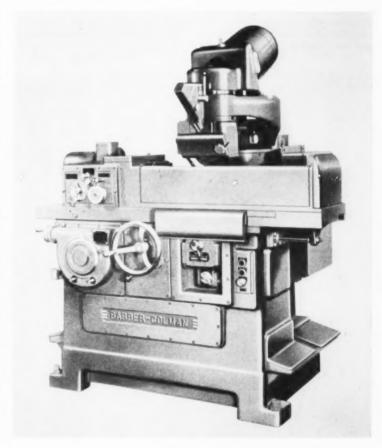
The cross-rail and bed have replaceable hardened steel ways, and the table and upper carriage that carry the spindle are mounted on roller bearings. This construction results in easy operation. Adjustable stops are furnished for the table, the upper carriage that carries the spindle, and the depth control of the spindle. The distance between the center line of the spindle and follow-up pin is also adjustable. The machine may be equipped with a special hydraulic power feed unit for actuating the table or the carriage carrying the spindle, or both. A single lever gives the operator finger-tip control of any feed from 0 to 160 inches per minute in either direction. The machine can also be had with tracing attachments.

#### Barber-Colman Hob-Sharpening Machine

The Barber-Colman Co., Dept. M, Rockford, Ill., has brought out a precision machine for the production sharpening of high-speed steel and carbide-tipped hobs and form-relieved cutters. This machine is equipped to provide accurate controls over flute spacing, rake angle, lead of gash, and surface finish. Its positive controls furnish a fast, simple means for maintaining uniform finish and accuracy.

The machine will sharpen a wide variety of tools with straight or helical flutes, shell or shank type, up to 6 inches in diameter and a face width of 5 inches. It is equipped for wet grinding. Used with a diamond wheel, it provides an effective production method for sharpening carbide-tipped hobs and form-relieved cutters.

All elements of the machine cycle are automatically controlled once the settings have been made. The machine automatically in-



Hob and form-relieved cutter sharpening machine built by the Barber-Colman Co.

dexes and feeds to remove exactly the desired amount of metal from each flute. The table speed is easily adjusted by turning the hydraulic flow control valve. A central push-button panel provides finger-tip control over machine elements. This control system makes it possible for a single operator to handle several machines at the same time.

#### Niagara Presses Feature Electropneumatic Clutch

Series AA open-back inclinable presses, manufactured by the Niagara Machine & Tool Works, 683 Northland Ave., Dept. M, Buffalo 11, N. Y., are equipped with an electropneumatic clutch. This unit combines the advantages of friction and mechanical sleeve clutches. The positive drive can be engaged or disengaged at any point in the stroke. There are no friction members to slip, heat up, or wear. It can be operated one stroke or jogged, and stops automatically if power fails.

The presses can be used for blanking, forming, drawing, perforating, and in combination die and automatic feeding operations, and may be fed from either side



Fig. 2. The clutch featured in Niagara Series AA presses

or from the front or back. Eight sizes are available, with shaft diameters from 3 to 7 1/2 inches.

#### Thompson Surface Grinders for Small Parts

Two Type F surface grinders for the tool-room or for small-parts production have been introduced by the Thompson Grinder Co., Dept. M, Springfield, Ohio. Features include a cross-feeding wheel-head, in-position wheel truing, and fast spark-out. Bed and slide ways are flame-hardened. A two-speed motor with safety interlock permits the use of either 7-or 12-inch wheels. With a mi-

crometer stop, previously ground work can be rechucked, and as little as 0.0001 inch of stock removed. The two sizes of grinding machines available are 6 by 10 by 18 inches and 8 by 10 by 24 inches.

#### Peerless Special Transfer Machine

A special transfer type machine built by the Peerless Production Co., Dept. M, 19947 Glendale Ave., Detroit 23, Mich., processes various differential carriers, accomplishing all the work formerly done by several machines comprising the equipment of a complete department. On receiving the castings, it roughs and finishes them, and then completes the rough- and finish-boring and facing operations, as well as the drilling and tapping. Even with such diversified operations it still holds the work to precision boring and facing tolerances.

Although this transfer machine was built to handle a special, intricate job, its flexibility makes possible individual-operation setups for a wide range of work. With the set-up shown, this machine processes forty heavy truck-

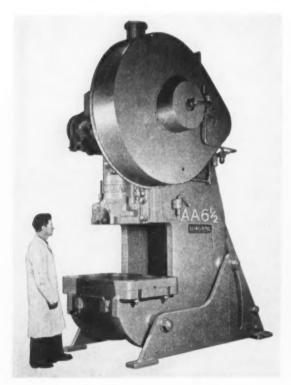
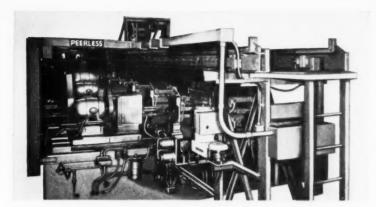


Fig. 1. Niagara press with electropneumatic clutch



Thompson Type F surface grinder suitable for the tool-room



Peerless special machine for processing differential carriers

axle carriers per hour. It has five working, one loading and unloading, and two idle stations; and utilizes a hydraulically actuated transfer mechanism for moving pallets. A feature is the power operated overhead pallet-return conveyor and elevators.

#### Diebel Automatic Press

The Di Machine Corporation, 2701 W. Irving Park Road, Chicago 18, Ill., has announced a Diebel 40-ton automatic press with back-to-front feed for stamping operations on stock up to 23 inches in width. The use of air cylinders to clamp the stock assures positive feeding of soft metals without distortion. The length of feed is infinitely variable from 0 to 13 inches.

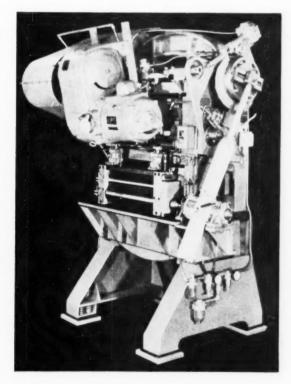
Features include the Diebel cylindrical type ram designed for accurate alignment of punch and die. Four bronze bearings support the crankshaft. The pneumatic clutch used in conjunction with a variable-speed motor permits operation at speeds ranging from 72 to 360 strokes per minute.

#### Buhr Special Crankshaft Processing Machine

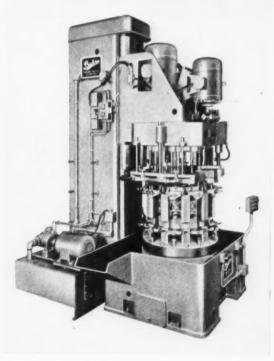
Twenty-six operations are performed on V-8 engine crankshafts at a production rate of ninety-six pieces per hour, using a special multiple-spindle machine built by the Buhr Machine Tool Co., Dept. M, Ann Arbor, Mich. The equipment of this high-production machine consists of a combination drilling and tapping head with twenty-six spindles, a ten-station holding fixture, and a precision automatic indexing table.

Operations include drilling and tapping six holes of 7/16-inch diameter, 20 threads per inch.; drilling and reaming one 7/16-inch dowel hole; and drilling, reaming, and counterboring the center hole. The fixture was designed to facilitate making changes at a later date to suit alterations in the crankshaft design.

An outstanding feature of this machine is the combination drilling and tapping head built as one unit. Other features include hardened and ground tool-steel ways; automatic lubrication; ball-bearing multiple heads with shaved gears; and hydraulic and electrical installations that conform to J.I.C. standards.



Diebel automatic press built by Di Machine Corporation



Buhr special machine for processing crankshafts

#### **Famco Squaring Shears**

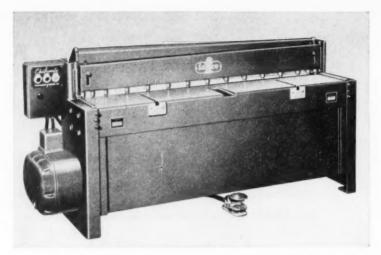
A line of redesigned squaring shears-eight power-driven, six foot-operated, and four air-actuated types-has been brought out by the Famco Machine Co., Dept. M, Kenosha, Wis. These presses have a capacity range for cutting from 20- to 14-gage mild steel sheets in widths from 22 to 72 inches. Special knives are available for shearing plastics and paper. Each shear in this line is of rigid, all-steel box-type construction, and is equipped with reversible four-edged alloy steel knives.

The foot-operated shears are built to cut 16- and 18-gage mild steel in 36-, 42-, and 52-inch widths, and 18 gage sheets in 22-, 30-, and 72-inch widths. The air-actuated shears cut 16-gage mild steel in 36-, 42-, 52-, and 72-inch widths.

Power-driven shears, like the Model 1672 illustrated, are provided with fast-acting Electromatic clutches.

#### Besly Double-Spindle Grinding Machine

Both faces of small parts are ground simultaneously on the Besly Model 905 18-inch doublespindle vertical grinding machine produced by the Besly-Welles Cor-



Famco power-driven shear equipped with Electromatic clutch

poration, Dept. M, Beloit, Wis. Except for loading and emptying hoppers, operation of the grinder is automatic. The parts are fed into a continuously rotating wheel which, in turn, carries them between two abrasive wheels. Accuracy is held to 0.002 inch of size, and 0.0003 inch of flatness and parallelism. After grinding is completed, the parts are unloaded by gravity into a discharge pan.

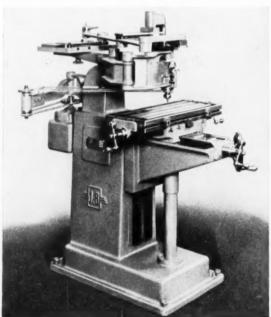
A special safety mechanism assures proper loading of the work. Should a piece fail to enter the wheel properly, a radially mounted arm releases a limit switch and breaks the electrical circuit to the fixture motor.

#### Johnson & Bassett Pantograph Engraver

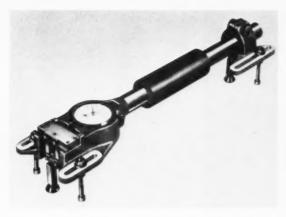
A two-dimensional pantograph engraver, designed for the production engraving, profiling, and diecutting of steel, cast-iron, nonferrous metal, and plastics, has been introduced by Johnson & Bassett, Inc., Dept. M, 114 Foster St., Worcester, Mass. With the



Besly machine simultaneously grinds both faces of work



Panto-Miller, a two-dimensional pantograph engraver





(Left) Federal universal internal and external gage; (right) snap gage for "Christmas tree" serrations

spindle arm locked, this Panto-Miller can perform conventional milling. Exact settings of reductions from 1 to 1 up to 1 to 40 are easily obtained, and a simple dial controls spindle speed, which is infinitely variable from 1200 to 1500 R.P.M. The standard copytable of the machine is 10 1/2 by 16 inches, and the work-table is 10 by 26 inches.

#### Federal Special Gages

A universal internal and external gage for shallow bores and short step diameters has been introduced by the Federal Products Corporation, Dept. M, 1144 Eddy St., Providence 1, R. I. This Model 88 P-10 gage has a tubular frame with an insulated hand

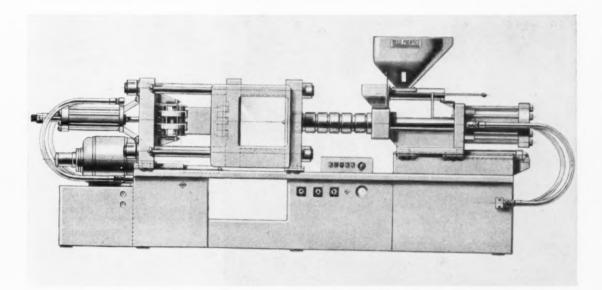
grip. Locating buttons can be adjusted to set the measuring contacts at the desired elevation. The measurement is transferred through a sensitive pantograph unit to a dial indicator, where it can be easily read. Stock parts are used in the design of the gage, and it can be furnished in lengths from 6 to 42 inches.

For measuring the widths of "Christmas tree" serrations in jet-engine compressor rotor discs, Federal has developed an adjustable snap gage, Model 294 P-205. It is compact and fully insulated from heat transfer by a wraparound Pregwood handle. The gage measures all three rows of blade serrations, regardless of their angles. Uniform gaging pressure is obtained independently

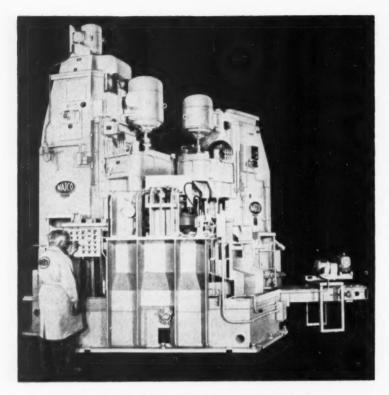
of the operator. The reference contact (a spherical tungsten-carbide ball) and the sensitive contact (two pieces of tungsten-carbide rod) are fastened to the jaws.

#### Reed-Prentice Plastic **Molding Machine**

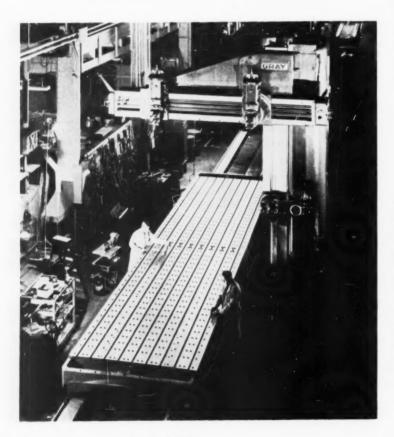
A 12- to 16-ounce plastic injection molding machine has been developed by the Reed-Prentice Corporation, Dept M, Worcester 4, Mass., which has increased plasticizing capacity, larger mold platens, and a new feed hopper. The 10-second cycle of this Model 300T machine boosts molding speed up to 360 shots per hour. In actual production, a stuffing arrangement built into the ma-



Injection molding machine for plastics brought out by the Reed-Prentice Corporation



Natco automatic machine drills and reams track link bushings



chine permits making "shots" of 16 ounces or more through the use of multiple strokes.

A newly designed heating cylinder plasticizes up to 115 pounds of thermoplastic material per hour. The heater has ceramic heating elements and its simplified design facilitates maintenance. Four tiebars of 4-inch diameter form a rugged frame for the mold platens and double shear link mechanism which develops a 300-ton positive mechanical clamping pressure. By means of an adjustment in the link cylinder, the mold clamping stroke is readily adjustable between 7 1/2 and 12 1/2 inches.

Mold platens measure 29 by 32 1/2 inches and will accommodate molds as large as 29 by 20 1/2 inches.

#### Natco Core-Drilling and Reaming Machine

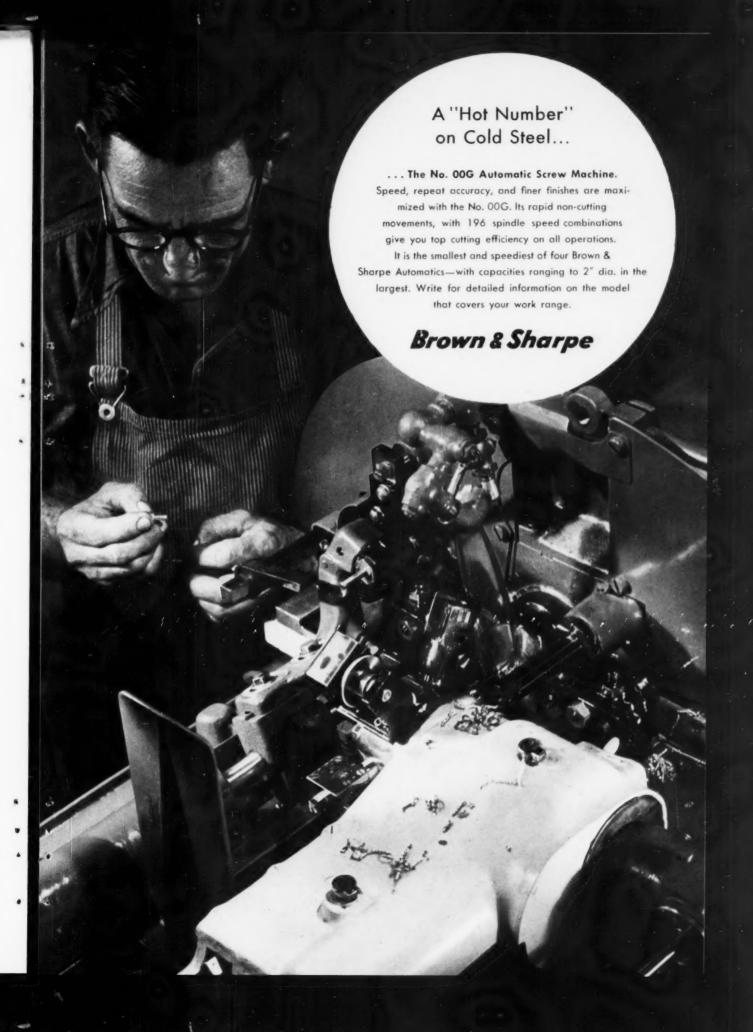
A "Holesteel" automatic, multiple-spindle vertical indexing machine for core-drilling and reaming track link bushings for tractors has been announced by the National Automatic Tool Co., Dept. M, Richmond, Ind. This special machine performs both operations for six different sizes of bushings. It has a five-position index-table, two vertical spindle heads with a total of twenty chucks, and automatic loading and unloading mechanisms. Indexing and machining cycles are set up from a push-button panel. Each movement in the cycle can be run individually to facilitate set-ups.

### Gray Open-Side Planer of Giant Size

The G. A. Gray Co., Dept. M, 3611 Woodburn Ave., Cincinnati 7, Ohio, has built a 120- by 108-inch by 30-foot heavy-duty, high-speed, open-side planer. This giant machine tool has just been installed in the plant of the Bethlehem Pacific Coast Steel Co., and is believed to be the largest modern planer on the West Coast.

The machine weighs in excess of 284,000 pounds and required six freight cars to transport it. The planer, which was almost two years in the building, is shown being tested prior to its disassembly and shipment.

Huge open-side planer designed and built by the G. A. Gray Co.





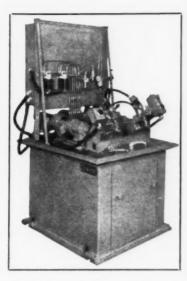
#### Drill for Right- and Left-Hand Parts

A machine that drills rightand left-hand parts simultaneously has recently been announced by the Govro-Nelson Co., Dept. M, 1933 Antoinette, Detroit 8, Mich. This machine incorporates four Govro-Nelson automatic drilling units and, in the set-up illustrated, tap-drills two 1/4-inch holes with 20 threads per inch in two automobile door handles in one operation. The production rate is about 600 parts (1200 holes) per hour.

The operator loads the machine with two parts, and depresses the start-cycle buttons with both hands, whereupon the work is automatically clamped, drilled, unclamped, and ejected.

#### **Covel Surface Grinder**

A low-cost, small precision surface grinder well suited to gage and form-tool work is being introduced by the Covel Mfg. Co., Dept. M, Benton Harbor, Mich.



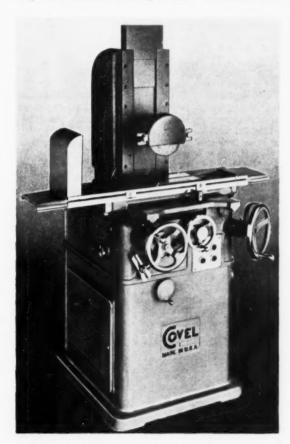
Govro-Nelson machine designed to drill right- and left-hand parts

This No. 10 machine has a longitudinal table travel of 20 inches, a transverse table travel of 7

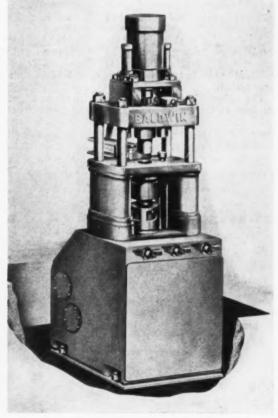
inches, and a vertical wheel travel of 15 inches. The spindle is driven by a 1-H.P. motor. A 1/6-H.P. 1200-R.P.M. reversing motor drives the table through a variable-speed mechanism at 15 to 50 feet per minute. For extremely close work, the transverse and vertical slides can be equipped with indicators for use with gage-blocks or measuring rods.

#### **Baldwin Compacting Press**

A Baldwin-Defiance Model I., 50-ton compacting press, built by the Baldwin-Lima-Hamilton Corporation, Dept. M, Philadelphia 42, Pa., offers high-quality production of powdered metal parts at low cost. It is a mechanical four-column, crank type press equipped with a flywheel and a pneumatic clutch and brake. The press has a 10-H.P. variable-speed drive. Provision has been made for quick and accurate adjustment of compacted part density or weight while the press is in operation. Visual indicators for the top



Surface grinder developed by Covel Mfg. Co. for gage and form-tool work



Metal powder compacting press introduced by the Baldwin-Lima-Hamilton Corporation

punch position, core float downstop position, depth of fill, and ejection stroke are read directly to 0.001 inch.

A hydraulic head assures accurate pressure control, and a shuttle type feeder maintains a constant volume of material over the die cavity. Cycling can be continuous, or include an automatic dwell at any point in the stroke. The press can also be "inched," or operated on single stroke, with or without a dwell period.

### **Equipment for Lapping Shoulder Faces of Shafts**

The Crane Packing Co., Dept. MYN, 1800 Cuyler Ave., Chicago 13, Ill., has recently developed a method for lapping shoulder faces of small shafts. The method consists of providing the lap plate of a "Lapmaster" machine with a series of annular grooves to accommodate the stem of the work-piece so that the shoulders "ride" the top of the lap plate during the operating cycle. Fuel pump parts lapped on the machine illustrated, for example, are preloaded into a special brass cylindrical work-holder that has been bored out slightly over size to receive the work-piece. These special work-holders provide the weight and balancing properties required to obtain the desired lapping action.

The adjustable roller guides at the base of the conditioning ring guide-stems are so located with respect to the perimeter of the work-holder that the parts being



A micrometer being set to one of the blocks in the Ultra-Chex set

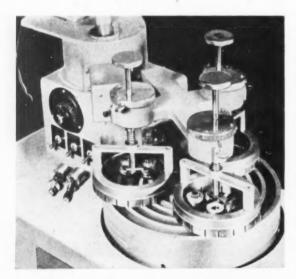
lapped will be held in the proper position. Ball-bearing races in the guides reduce friction to a minimum and the work is free to rotate in its own orbit on the lap.

#### Small Lathe Tracing Attachment

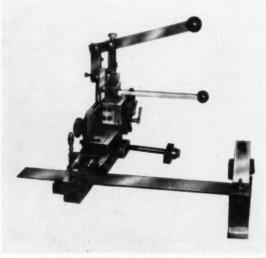
A Karge tracing attachment for turning bar stock on small engine lathes is being manufactured by the Turnomat Co., Inc., Dept. M, Brockport, N. Y. The work is supported immediately ahead of the cutters in a free-revolving collet bearing, so that, in effect, the attachment utilizes the box-tool principle. Small-diameter bars can be held in a drill chuck, and can be of any length within the capacity of the lathe. A tie-bolt fastens the device to the compound rest. Cross-slide movement is controlled by a stylus that follows a template attached to the front of lathe bed.

#### Low-Cost Gage-Block Set

A low-cost nine-piece Ultra-Chex gage-block set, offering 331 possible combinations about 0.025 inch apart, has been announced by the George Scherr Co., Dept. M, 200 Lafayette St., New York 12, N. Y. The blocks, accurate to within 0.000005 inch, are 0.0625, 0.1, 0.125, 0.2, 0.25, 0.3, 0.5, 1, and 2 inches thick. Reliable measurements in 0.0001 inch can be obtained with micrometers, verniers, or dial indicators. The instruments are first checked and set by means of the blocks to the exact or nearest dimension required. For a few additional thousandths of an inch beyond the gage-block setting, any slight inaccuracies in the instruments, such as leadscrew error, may be discounted. An optical parallel, 1 1/4 inches in diameter and 1/2 inch thick, is available as optional equipment.



Crane machine that laps shoulder faces of shafts



Karge tracing attachment mounted on an Atlas engine lathe



Photos courtesy→ The Cleveland Pneumatic Tool Company, Cleve-land, Ohio.

The convenient centralized controls, the wide range of speeds and feeds, and the high visibility head of this Cincinnati Bickford Radial Drill are all contributing to fine performance on this job.

The Cleveland Pneumatic Tool Company say "Performance and ease of handling are all that could be desired."

On this cylinder for an aircraft nose type landing gear, drilling, reaming and spot facing operations are being done.

Cincinnati Super Service Radial Drills are accurate, powerful and profitable in the shop.

Write for Bulletin R-29.





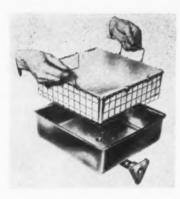
RADIAL AND UPRIGHT DRILLING MACHINES

CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

For more information on products advertised, use Inquiry Card, page 261

MACHINERY, April, 1954-255



#### Delpark Junior Filter for Coolants

Filter for coolants used on grinding, shaving, hobbing, lapping, and similar machine tools. This filter is especially adapted for use where the coolant flow is relatively slow. It provides positive, continuous filtration, removing abrasive solids from the coolant as it comes from the work. This facilitates the maintenance of close tolerances and a fine finish on the work. It also serves to lengthen the life of cutting tools and grinding wheels. When the disposable filter tray becomes so filled with swarf that it will no longer take the flow of coolant, it is easily replaced. Product of Industrial Filtration Co., Dept. 289, Lebanon, Ind.

#### Warner Small-Size Electric Brakes and Clutches

Small-size electric brakes, clutches, and clutch couplings designed for fast, accurate control of low-torque drives have been announced by the Warner Electric Brake & Clutch Co., Dept. M, Beloit, Wis. These units are smaller than a man's hand. They offer certain advantages for a wide variety of power transmission applications. High-speed engagement and release, coupled with unusually high torques, make the units adaptable



to starting, stopping, indexing, rapid cycling, synchronizing, torque limiting, indexing, jogging, and single-revolution cycling applications on small, electrically operated instruments and machinery. Push-button or automatic operation with limit switches, relays, electric eyes, and other electric controls makes possible a wide range of applications. All units operate on 6 to 15 watts, direct current. Three models are available, with speed ratings of 10,000, 7200 and 4500 R.P.M. and torque capacities of 8, 60, and 240 inchpounds. Direct-current ratings of these models range from 6 to



#### Positive Pressure Immersion Type Coolant Pump

"PresSureKool" positive pressure, immersion type pump especially designed for pumping coolants contaminated with abrasives. This pump has been developed by Associated Engineers, Inc., Dept. M, Box 1628, Springfield, Mass., primarily for machine tool applications where higher than ordinary pressures are required. It is capable of pumping coolants in the varying viscosities of all commercial coolants and is adatped for use on lathes, grinders, millers, automatic screw machines, planers, and other types of machines employing coolants. The pump is now made with pedestal 2 3/8 inches in diameter and in heights of 10 and



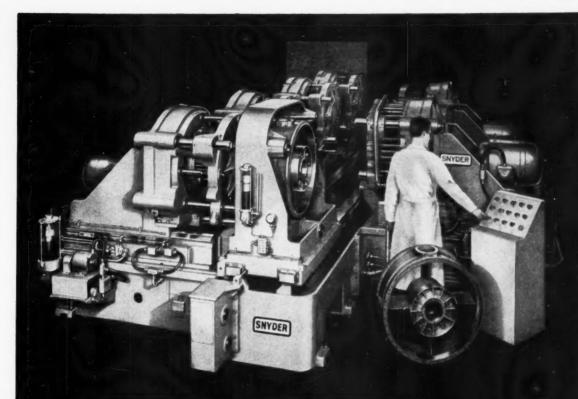
#### Little Giant Chip Retriever

Chip retreiver made of super-magnetic alloy developed to offer lifetime service through a single-pole magnetic process. This retriever removes chips from blind drilled and tapped holes on production lines, and in assembly work. It is also useful in testing surface coatings to determine magnetic properties of the under-surface material. The unit is 6 1/4 inches long and is available in 1/4- and 1/8inch diameters. Product of General Scientific Equipment Co., Dept. M, 2700 W. Huntingdon St., Philadelphia 32, Pa.

### Threaded Insert Designed for Quick Installation

Improved "WEG" threaded insert made with slot to permit quick installation with a screwdriver. This product of Roylyn, Inc., Dept. M, 1706 Standard Ave., Glendale, Calif., provides a permanent thread anchor for bolting metal to metal. It can also be used in fastening wood and plastic members. The insert consists of a single part that can be quickly locked in position with pins. Sizes up to 1/4 inch are slotted for installation with a screwdriver. Larger sizes are installed with a simple insert driver. The inserts are self-tapping in wood and can be cast in molded





## SNYDER SPECIAL

4-STATION, AUTOMATIC LINE INDEX

MACHINE DRILLS, REAMS, CHAMFERS

420 HOLES AN HOUR IN SIX LARGE

CAST ALUMINUM AIRCRAFT PARTS

AT 80% EFFICIENCY.

## STYDER TOOL & ENGINEERING COMPANY

3400 E. Lafayette, Detroit 7, Michigan

29 Years of Successful Cooperation with Leading American Industries plastic. They are useful where frequent installation and removal damage original threads in the material. Also, they can be used in salvaging damaged parts.

versed and used in either right- or left-hand bodies. The cutter is available in five standard sizes, ranging from 6 to 14 inches in diameter.



#### Facé-Milling Cutter with Solid-Carbide Replaceable

Blades

Super Tool Co., Dept. M, 21650 Hoover Road, Detroit 13, Mich., has announced a solid-carbide inserted-blade face-milling cutter designed for milling cast iron, malleable iron, brass, and similar work. This cutter has a greater number of solid-carbide blades than previously supplied and permits the use of higher speeds as well as faster feeds, resulting in higher production and better finish. The blades are extra heavy and are arranged radially for maximum blade life. They can be re-

#### Variable-Speed Drive

Variable speed 1/8- to 1/4-H.P. drive unit with built-in magnetic disc brake motor in 42-48 frame. This unit provides for instant stopping as frequently required for indexing tables, welding positioners, and physical property testers. The brake is 5 inches in diameter, less than 3 1/2 inches in length and is mounted directly on the end of the motor. Features of the unit include an external manual release automatic reset mech-



anism, new friction elements that eliminate lining wear adjustments, and a brake enclosure applicable to both open or totally enclosed motors. The transmission shown is equipped with the standard micrometer control which may be read accurately to 1/400 of the dial periphery. Remote mechanical, electrical, or pneumatic control can also be had. Product of Graham Transmissions Inc., Dept. M, Menomonee Falls, Wis.

#### Williams Open- and Box-End Wrench

Open- and box-end "Superrench" of line brought out by J. H. Williams & Co., Dept. M, 400 Vulcan St., Buffalo 7, N. Y. A redistribution of weight in these wrenches is said to have created exceptional balance. Slimmer heads and longer and narrower handles are improve-

ments that make this line of wrenches more comfortable to work with and permit nut rotation in more difficult and confined quarters. Both heads of this improved type wrench have the same size openings in a range of sizes from 1/4 inch to 1 5/8 inches.





#### **Dial Bore Gages**

Small-size dial bore gages announced by Standard Gage Co., Inc., Dept. M. Poughkeepsie, N. Y. A No. 000 gage covers sizes from 1/4 down to 3/16 inch, and a No. 0000 gage has a range from 3/16 to 1/8 inch. Like the existing model which covers sizes from 3/8 to 1/4 inch, both of the new gages employ the centering-size disc principle whereby a removable disc of nearly the bore size centralizes the head and at the same time serves as one of the contacts. The discs are positively locked in position by means of a clamping sleeve and knurled nut.

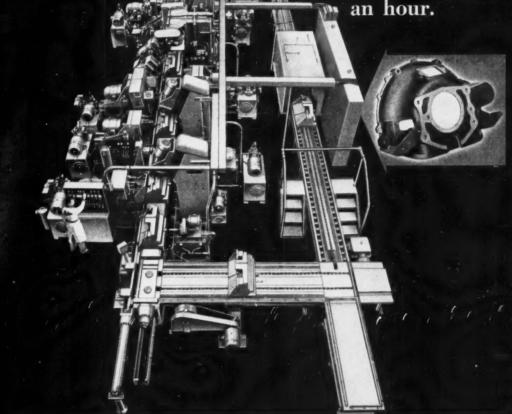


#### Dumore "Handgrinder" for Precision Tool and Die Work

"Super-10 Handgrinder" introduced by the Dumore Co., Dept. M, 1300 Seventeenth St., Racine, Wis. This grinder has a 1/10-H.P. Dumore continuous-duty, 115-volt, alternating- and direct-current universal motor which provides speeds up to 22,000 R.P.M. and swings vitrified wheels up to 1 inch in diameter. Its over-all length, including chuck, is 10 1/4 inches and the body diameter, 2 7/16 inches.

# Bulb SPECIAL...

Drills, Chamfers, taps, bores, reams and mills
120 Clutch Housings
an hour.



Designed to perform identical operations on two different parts. Through Selector Switches, change-over from one part to the other takes only seconds.

Twelve stations perform all 68 operations.

Fixtures automatically indexed from station to station, and go through Cleaning Station on return to Load Station, where Power Wrench clamps and unclamps.

Production is 120 parts per hour at 100% efficiency.

#### BUHR MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

Buhr

HIGH PRODUCTION MACHINERY

#### TYPICAL STANDARD BUHR FEATURES INCLUDE:

- \* Built-in chip conveyor.
- \* Automatic lubrication throughout.
- Hydraulic and electrical equipment to J.I.C. standards.
- \* Hardened and ground tool-steel ways.

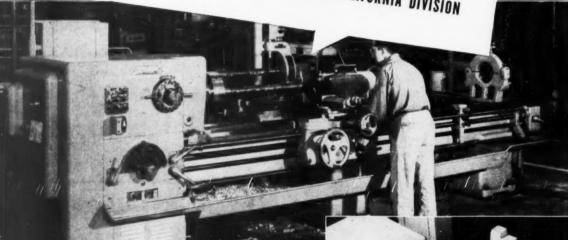
Write for Buhr 48-page Catalog

## SIDNEY can do this for you, too!

"EXPERIENCE WITH THE SIDNEY 20" TRACING LATHE IN DEPARTMENT B6-406 OF THE DOUGLAS EL SEGUNDO, CALIFORNIA DIVISION INDICATES A CONSIDERABLY IMPROVED PRODUCTION CAPACITY. THE TRACING LATHE WE ARE OPERATING

ELIMINATES HUMAN ERROR AS FAR AS LINEAL DIMENSIONS ARE CONCERNED."

DOUGLAS AIRCRAFT CO., INC. EL SEGUNDO, CALIFORNIA DIVISION



The tracer head pictured . . . the "brains" of the tracer parts all impulses to the various operating units as it follows along a template or master piece relating to these units their necessary functions in order to produce the work at hand

One piece or a million . . . it's all the same to the Sidney Tracer Lathe . . . and all the work pieces are the same . . . every time

WRITE FOR BULLETINS

THE SIDNEY MACHINE TOOL CO. . SIDNEY, OHIO

Builders of Precision Machinery since 1904

## PRODUCT INFORMATION SERVICE

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On products mentioned in the editorial pages
On products shown in the advertisements

#### **NEW CATALOGUES**

DRILLING—Buffalo Forge Co., Buffalo, N. Y. Bulletin 3900, entitled "Guide Book for Better Drilling," compiled by R. H. Rideout, Chief Engineer, Drill Division. Includes drilling and tapping charts, tips on selection and application of "Buffalo" drilling machines; twist drill definitions; types of points and diagrams; twist drill failures and their causes; table on feeds and speeds for drills of high-speed steel; and other helpful information for users of drills. This 24-page booklet is available to interested firms through Buffalo Forge dealers.

GEAR GRINDING MACHINES—Gear Grinding Machine Co., 3901 Christopher, Detroit 11, Mich. Catalogue providing specific information on Geargrind machines, as well as on types and specifications of gears, splines, and special contoured parts that can be ground on them. Catalogue can be obtained by writing on company letterhead direct to the above address.

SCREW THREADS—Greenfield Tap & Die Corporation, Greenfield, Mass. 52-page handbook of uniquely arranged information on Unified and American screw threads. Tap and product limits and tolerances, and suggested taps and tap drills for every diameter and class of threads are given. Available on request by individuals in responsible positions.

ENGINEERING RESEARCH FACILITIES
—Designers for Industry, Inc., 2915 Detroit Ave., Cleveland 13, Ohio. Booklet
showing the company's facilities for diversified engineering research and development. Can be obtained on company
letterhead request direct to the above
address.

GRINDING OILS—D. A. Stuart Oil Co., Ltd., Chicago, III. 16-page book on the characteristics and functions of seven Stuart products, Proper applications of the various grinding oils are covered and specific recommendations are made for

LUBRICANTS FOR METAL-WORKING OPERATIONS—Metal Carbides Corporation, Youngstown, Ohio. Technical Bulletin TB-2 entitled "Recommended Coolants and Lubricants for Talide Tungsten Carbide Cutting Tools and Drawing Dies." Included in the recommendations are coolants and cutting oils for machining all types of steel, ferrous and nonferrous metals, and non-metallic materials, as well as lubricants for drawing all types of wire, bars, and tubes... 3

PLANT MODERNIZATION—The Cross Company, Detroit, Mich. Booklet entitled "How to Get the Most Out of Capital Expenditures," prepared by Ralph E. Cross, executive vice-president of the company. It presents answers to the perplexing problem of plant modernization for the guidance of management, production engineers, and executives who are interested in replacing equipment. . . 5

POWER TOOLS—Delta Power Tool Division, Rockwell Mfg. Co., Pittsburgh, Pa. Condensed specifications folder cataloguing the principal Delta tools designed for the metal-working industry, such as drill presses, cut-off machines, metal-cutting band saws, finishing machines, belt grinders, metal shapers, carbide tool grinders, welders, and toolmaker grinders. Folder can be used as wall chart. 6

TAPS—Landis Machine Co., Waynesboro, Pa. Bulletin G-92-2, on Landis solid adjustable taps recommended for initial tapping operations on reversing spindle machines and for automatic screw machines where limited clearance prohibits use of a collapsible tap. Also described is a Landis special solid adjustable tap designed for tapping and chamfering standard malleable and cast-iron pipe fittings in one operation.

CARMET CEMENTED CARBIDES—Allegheny Ludlum Steel Corporation, Pittsburgh, Pa. Carmet Methods Manual on cemented carbides. Information is included on tool design, brazing, grinding, chip-breakers, set-ups, coolants, cutting speeds, and reference data. All grades of Carmet cemented carbides are listed, including tungsten, titanium, and tantalum carbides, together with typical applications.

SUPERFINISHING—Gisholt Machine Co., Madison, Wis. Form 1169, entitled "Gisholt Superfinishers," containing 29 pages of information on the Superfinish metal removing process. Besides a brief description of the process, specifications on the twelve Gisholt machines and five

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SPECIALIZED PRODUCTION EQUIP-MENT—Peerless Production Co., Detroit, Mich. 28-page catalogue containing detailed information on eighteen representative special machines for the metal-working industry. A resume of other Peerless products and services is included. According to the company, the catalogue will be supplemented from time to time with loose-leaf inserts. . 11

DYNAMOMETER SYSTEMS — General Electric Co., Schenectady, N. Y. Bulletin GEA-5923, on dynamometer systems for testing internal combustion engines, transmissions, torque converters, and many other types of equipment. How G-E direct-current dynamometer systems can be used for both motoring and absorption applications is explained. . . . . . 13

FOUNDRY MECHANIZATION — Link Belt Co., Chicago, Ill. Book 2423, containing 40 pages describing and illustrating the company's line of materials-handling equipment for the mechanization of ferrous and non-ferrous foundries. There are three sections—complete installations; tested lay-outs of foundry installations; and foundry equipment. . . . . 14

MEEHANITE CAMS, CAMSHAFTS, AND CRANKSHAFTS—Meehanite Metal Corporation, New Rochelle, N. Y. Booklet providing a varied series of applications where Meehanite cams, camshafts, and crankshafts have solved problems in machine design. A table is included listing the physical properties of the general engineering types of Meehanite metal. 15

THERMOCOUPLE WIRES—Thermo Electric Co., Inc., Saldle River, N. J. Bulletin 31, illustrating and describing the T-E thermocouple and extension wires most often used for standard pyrometric work. Included are charts on resistances of solid and stranded conductors, weights, and other data. 17

"S" MONEL—International Nickel Co., Inc., New York City. Booklet describing the engineering properties of "S" Monel, an age-hardenable casting alloy that provides unusual strength, hardness, and anti-galling properties at temperatures up to 1100 degrees F., besides the general corrosion resistance of Monel. . . 18

NICKEL - CHROMIUM - MOLYBDENUM STEELS—International Nickel Co., Inc., New York City, Bulletin NS-1, containing fourteen charts on the composition, heat-treatment, transformation characteristics, and mechanical properties of the standard AISI and S A E nickel-chromium-molybdenum steels, Type 4300 series.

AIR-OPERATED CLUTCHES—Industrial Clutch Corporation, Waukesha, Wis. Bulletin 5005, on the "LK" line of air-operated clutches and brakes engineered primarily for use where frequent high-speed starting and accurate stopping, coupled with low-power loss and high heat-dissipating capacity, are required. 20

OPEN-BACK INCLINABLE PRESSES-Niagara Machine & Tool Works, Buffalo, N. Y. Bulletin 57A, presenting the new Niagara Series AA open-back inclinable presses, and describing such features as the electro-pneumatic clutch and clutch control, centralized lubrication, automatic feeds, and the variable-speed drive.

HONING MACHINES—C. Allen Fulmer Co., Cincinnati, Ohio. Booklet featuring Fulmer honing machines for precision finishing of internal cylinders. The honing process is explained, and typical applications are presented. Also described are Alexander Ball honing tools. . . . 22

IMPACT DATA ON WELD METAL—International Nickel Co., Inc., New York City, Bulletin A-165, impact data compiled from tests made by the research laboratories of the International Nickel Co. and the Arcos Corporation on welded austenitic stainless steels. . . . . . . . 23

WHEEL LATHES—Consolidated Machine Tool Corporation, Rochester, N. Y. Bulletin 3101, containing 23 pages of data on the Sellers tracer control wheel lathe, describing the basic structure of the machine, cutting tools, the hydraulic system, the contouring cycle, and lubrication. 24

STAINLESS-STEEL SELECTOR—Crucible Steel Company of America, Pittsburgh, Pa. Crucible Rezistal stainless-steel selector chart designed especially for the use of fabricators, designers, and purchasing agents. Available to any metal-working shop.

COOLANT FILTERS—Industrial Filtration Co., Lebanon, Ind. Bulletin describing Delpark coolant filters for use on Cincinnati precision grinding machines and showing four installations. How the Delpark filter operates is explained. . . . 27

#### **Product Information Service**

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JALCASE WHEELS—Jones & Laughlin Steel Corporation, Pittsburgh, Pa. Booklet describing the ten grades of Jalcase, a free-machining, open-hearth steel with mechanical properties for high-quality machined parts. Typical uses are listed.

INDUSTRIAL PLASTICS—Joseph T. Ryerson & Son, Inc., Chicago, Ill. Bulletin containing data on the manufacture, grades, properties, fabrication, and use of Ryertex plastics. The machining of sheets, tubes, and rods is discussed. 31

OIL-HYDRAULIC CYLINDERS AND YALVES—Pathon Mfg, Co., Cincinnati, Ohio. Bulletin 22, containing engineering information on Pathon oil-hydraulic cylinders and valves. Included is a chart on hydraulic cylinder functional requirements.

CENTRALIZED LUBRICATION—Farval Corporation, Cleveland, Ohio. Booklet entitled "Studies in Centralized Lubrication—1954," giving case histories which show how Farval centralized lubrication systems have lowered production costs. 36

METAL DISINTEGRATORS—Electro Arc Mfg. Co., Ann Arbor, Mich. Bulletin 541, descriptive of the company's metal disintegrators for piercing holes in metals and removing broken tools in tool-rooms. Fifteen typical jobs illustrate their performance. 37

GRINDING FIXTURE—Harig Mfg. Corporation, Chicago, III. Folder descriptive of the Harig Grind-All fixture for carbide grinding and other uses, such as inspection, light milling, and radius dressing. 38

SPECIAL WORM-GEAR SPEED RE-DUCERS—Cleveland Worm & Gear Co., Cleveland, Ohio, Folder illustrating various Cleveland worm-gear speed reducers which were designed by the company's engineering department to meet special drive requirements.

**SHEET-METAL POLISHING**—Acme Mfg. Co., Detroit, Mich. Paper entitled "Flat Polishing—an Outline of New Techniques

(Continued on next page)

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in Sheet-Metal Polishing," consisting of a study on flat polishing presented by Adam Zimmerman at an SAE meeting.

TWIST DRILLS—DoAll Co., Des Plaines, III. Catalogue 51-816, giving data on a wide variety of DoAll twist drills, including the new XL drills. Helpful information on drill pointing and web thinning is given.

ARMCO STAINLESS STEELS—Armco Steel Corporation, Middletown, Ohio. Folder enumerating the various booklets on Armco stainless steels which are available from its stainless-steel "library."

LAPPING MACHINES—Size Control Co., Chicago, III. Bulletin L-53, descriptive of precision lapping by the centerless method and the Centerless lapping machine.

CENTRIFUGAL PURIFIERS FOR CUTTING OILS—Sharples Corporation, Philadelphia, Pa. Bulletin 1270, answering the question "Should I purify cutting oil in my shop?" and explaining how the Sharples centrifugal oil purifier works.

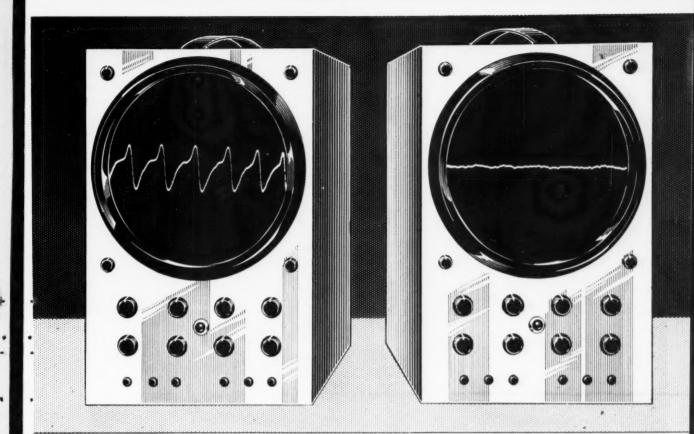
WELDING GUN—Air Reduction, New York City. Folder ADC-834, descriptive of the Aircospot gun, a water-cooled manual welding unit for the inert gas-aircleded spot welding of mild and stainless steel.

VERTICAL MILLING MACHINE—Duff Machine Co., Haverhill, Mass. Leaflet descriptive of the Duff vertical milling machine designed with a universal head to permit easy positioning of the spindle at any angle.

GRINDING WHEELS—Robertson Mfg.
Co., Morrisville, Pa. Folder descriptive of
Robertson Cool-Cut wheels for all types
of surface grinding. Concretely summarized are "Grinding Facts You Should
Know."

54

PORTABLE ELEVATING TABLE—Hamilton Tool Co., Hamilton, Ohio. Bulletin P-54, descriptive of the Portelvator, a portable height adjustable table and work-bench. 55



WHEN A STRAIGHT MINERAL OIL was used to lubricate the ways, an 0.0008" jump at frequency of 2.74 cycles per second was noted.

WHEN SUNOCO WAY LUBRICANT was used on the ways, the jump was too small to measure, proof that this medium stops slip-stick motion.

## TEST PROVES SUNOCO WAY LUBRICANT ENDS SLIP-STICK TABLE MOTION

How effectively Sunoco Way Lubricant stops slip-stick table motion is graphically illustrated by these oscillograms. The pattern on the left was made with a straight mineral oil as the lubricant; the other was made with Sunoco Way Lubricant on the ways. Both patterns are magnifications of changes in rate of table travel and were obtained under identical conditions.

You can stop slip-stick table motion, protect the ways, get better surface finishes, cut production losses with Sunoco Way Lubricant. Try it in your shop. For more information, call your nearest Sun office or write Sun Oil Company, Philadelphia 3, Pa., Dept. M-4.

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- ★ 53 parts per hour at 100% efficiency—capacity for spiral bevel or hypoid style carriers.
- ★ 97 operations: 60 drilling, chamfering and reaming; 5 milling; 4 spotfacing and counterboring; 28 tapping.
- \* 9 stations: 1 loading, 1 unloading, 7 machining.
- ★ Two-position, progressive type work holding fixtures with automatic transfer from station to station and integral conveyor for automatic return from unloading to loading station.
- ★ Cleaning unit for removing chips from fixtures between unloading and loading station.
- Other features: Complete interchangeability of all standard and special parts for easy maintenance; construction to J.I.C. standards; hardened and ground ways; hydraulic feed and rapid traverse; individual lead screw feed for tapping; coolant system; automatic lubrication.

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THE

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Special MACHINE TOOLS



#### **An Electronic Shock**

A master-mind computer that normally answers questions of space and time for the Hayden Planetarium was placed shortly before March 15 at the service of taxpayers as a neighborly first-aid gesture. The taxpayer simply provided his income, deduction figures, and five other items of fiscal importance—the information was then fed into the Elecom by an attendant and within eight measly seconds the blow was dealt.

#### The Five-in-One Tongue

Interlingua, a language for scientists and engineers consisting of English, French, Italian, Spanish, and Portuguese, as well as a little German, can be easily read, according to the Illinois In-

stitute of Technology which gives this example: "Energia es necessari pro toto que occurre in le mundo. In tempores passate le plus grande parte del energia applicate esseva fornite per le fortia muscular del homines e del animales domestic." ("Energy is necessary for all that occurs in the world. In past times the greatest part of the applied energy was furnished by the muscular strength of men and domestic animals." Easy, huh?) But to help you, there is a book teaching Interlingua with the aid of pictures.

#### The Congo Way to Spray

Sikorsky helicopters are being used in the Belgian Congo as part of a spraying program against the dreaded black fly and other insects, according to an article in *The Bee-Hive*, United Aircraft Corporation's quarterly. The natives call the plane that reaches otherwise inaccessible areas a "ventilator"—the word they use for the revolving overhead fan.

#### A Slip by a Slip

After inspecting a new factory, one of our editors wrote a letter to his host and top executive at the plant. His punch-line sentence suffered from the shorthand of a young stenographer, reading "The scope of operations at your plant amused me." The amazed, and not exactly amused, editor caught the error but from now on insists he will be overwhelmed, astonished, astounded—but never amazed.

See You at the A.S.T.E. Show-MACHINERY'S Booth is No. 530!

AMONG HIS SOUVENIRS, OR WHEN ATHEL MET BETTY—Betty Grable was happy to extend her dainty little hand to Athel Denham upon the occasion of their meeting at a business (semi?) function recently and it's easy to see that it wasn't difficult for Mr. Denham to take it. Incidentally, Denham & Co. (of which Mr. Denham is president) are counsel for the National Public Relations Committee of the American Society of Tool Engineers, and are handling publicity for the Philadelphia Show. So perhaps when you are visiting the exhibition, you will have the opportunity to shake the hand that shook the hand!



## MOUNS OF THE INDUSTRY

#### California and Texas

CARL L. GOSEWEHR has been made a representative in the Southwest Pacific territory by the Oilgear Co., Milwaukee, Wis. Mr. Gosewehr, who has served the company for several years in the pump assembly and test department, the engineering application department, the engineering field service, will have his headquarters at the Los Angeles, Calif., office—551 Roosevelt Bldg., 727 W. 7th St.

NOBUR MFG. Co., Burbank, Calif., maker of deburring and chamfering tools, has appointed the following representatives: for Michigan, ARTHUR S. DARLING & ASSOCIATES, 14716 Mayfield, Detroit; for Kansas, Nebraska, Iowa, and Missouri, J. J. RIOKETSON, 7914 W. 77th St., Overland Park, Kans.; and for Canada, JAMES MORTON CO. LTD., 126 Main St., Galt, Ontario.

L. W. Jordan has been appointed vice-president—Pacific Region—by the Linde Air Products Co., a Division of Union Carbide and Carbon Corporation, New York City, with headquarters in San Francisco, Calif. Mr. Jordan joined the Linde Air Products Co. in 1925 as an order clerk in the San Francisco district office, and became district manager there five years later. In 1935, he was appointed manager of the



L. W. Jordan, newly appointed vice-president—Pacific Region, Linde Air Products Co.

Pacific Coast Region, which comprises all of the territory west of the Rocky Mountains.

EDWARD H. FARMER has been appointed plant manager of the recently acquired San Jose, Calif.,



Edward H. Farmer, plant manager of the San Jose, Calif., Works of the E. W. Bliss Co.

works of the E. W. Bliss Co., Canton, Ohio. Mr. Farmer has been associated with the Lockheed Corporation, Burbank, Calif., for the last welve years, most recently as works manager. Prior to that, he was employed for twelve years by the E. W. Bliss Co., in the Toledo, Ohio Division, where he was assistant works manager from 1939 to 1941.

Donald E. Thal has been named central general manager of the Pacific Division of the Link-Belt Co., Chicago, Ill. Mr. Thal will have his headquarters at the San Francisco, Calif., plant, where he has been serving as sales manager. He has been with Link-Belt since 1936.

DR. JOSEPH REMENYI has been appointed chief design engineer for the Waldrip Engineering Co., Hollydale, Calif. He is a specialist in highly stressed parts for heavy equipment.

FRAY MACHINE TOOL Co. has moved to a new plant at 2935 N. Ontario St., Burbank, Calif.

IRA C. MATTHIESSEN has been named district sales manager for the Columbia Tool Steel Co., Chicago Heights, Ill., tool steel producer, in southern California. His headquarters will be at 416 W. 8th St., Los Angeles. Mr. Matthiessen has been with the company since 1942.

BERNIE H. MARKS has been made manager of a new office in Houston, Tex., opened by the Pangborn Corporation, Hagerstown, Md., manufacturer of blast cleaning and dust control equipment. This office is located at 1010 Scanlan Bldg., Houston 2. Mr. Marks was formerly a sales engineer in the Detroit office. Besides Texas, Mr. Marks will supervise activities on special equipment of the Oliver H. Van Horn Co. in Louisiana and lower Mississippi and Alabama.

HARRY S. CLARK has been appointed general manager of the Longview, Tex., plant of R. G. Le Tourneau, Inc. He will also retain his duties as manufacturing manager.

RICHARD H. McCARTHY has been appointed sales engineer with head-quarters at the Dallas, Tex., office of the Nordberg Mfg. Co., Milwaukee, Wis.

#### Illinois and Missouri

LINK-BELT Co., Chicago, Ill., has appointed the following district managers: JOHN D. RILEY, who was district manager at Newark, N. J., will now be at Cleveland, Ohio, succeeding the late Paul Wheeler; and HARRY G. ANDERSEN will assume the position vacated by Mr. Riley. Mr. Andersen had been at Birmingham, Ala., for the last three years.

ROBERT W. CLYNE has joined the PRESSED STEEL CAR Co. INC., New York City, assuming the position of vice pres.—marketing. Mr. Clyne was formerly an officer and divisional sales manager of the American Steel Foundries Co., Chicago, Ill. He will be located at the Chicago headquarters of the company.

RAY C. REINHARTSEN, vice-president and sales manager of the Onsrud Machine Works, Inc., Chicago, Ill., has been promoted to the position of executive vice-president

NOW

a quick, low-cost way to "tool-up" for bigger production



gives more efficient application of cutting oils for

- higher cutting speeds
   faster rate of feed
- longer tool life
   lower unit production costs

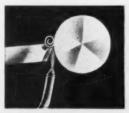
on tapping machines, drill presses, milling machines, grinders, lathes, boring machines, high-speed saws, stamping presses, die presses.

#### SEE IT AT THE ASTE SHOW

PIONEER AND LEADER IN OIL FOG LUBRICATION FOR 26 YEARS

- . VALVES . FILTERS . HOSE ASSEMBLIES
- . REGULATORS . LUBRICATORS





spray is applied to work area from any required direction to thoroughly lubricate critical areas of contact between cutting tool and work piece.





Fine spray rapidly dissipates heat...the spray lubricates tool more efficiently; has greater exposed ail surface area for fast, thorough dissipation of heat.

WRITE FOR COMPLETE DATA-NEW FOLDER No. 491



Ray C. Reinhartsen, executive vice-president and general manager of Onsrud Machine Works

and general manager. Mr. Reinhartsen, who has been with the company for twenty years, will now be responsible for plant production and production engineering. Also announced were the appointments of George M. Campbell, secretary, as vice-president and secretary; and Albert L. Breuer, assistant sales manager, as sales manager.

RICHARD WESSLING has joined the Allen-Bradley Co., Milwaukee, Wis., electric control manufacturer, having been appointed district manager of the Chicago, Ill., office. Mr. Wessling was formerly vice-president and director of the Electric Supply Corporation, Chicago, Ill.

Charles F. Johnson, assistant secretary and city sales manager for the Kropp Forge Co., Chicago, Ill., has retired after thirty-two years of service with the firm. Mr. Johnson has been associated with the Chicago steel industry for the last sixty-one years.

E. PHILBIN DE GOT, sales manager of the Chicago-Latrobe Division of the United Drill & Tool Corporation, Chicago, Ill., has been elected vice-president of United Drill & Tool. His duties will continue to be those of sales manager of the Division.

DR. ALEXANDER BLAKELY has joined the Metal Removal Co., Chicago, Ill., manufacturer of abrasives and die-sinking tools, in the capacity of vice-president in charge of manufacturing. The company also announced the opening of a sales office and warehouse in Detroit.

RUSSELL W. BILL has been appointed sales manager of the Shake-proof Division of the Illinois Tool

Works, Chicago, Ill. He will be located at the Division's headquarters in Elgin, Ill. Mr. Bill joined Shakeproof in 1935, and was eastern district manager since 1950.

Morse Chain Co., Detroit, Mich., has appointed the Power Transmission Equipment Co., 1245 W. Fulton St., Chicago, Ill., as a distributor in the Chicago area for Morse mechanical power transmission products.

M. A. ALTRUP has been named sales representative in eastern Missouri and southern Illinois for the Size Control Co., Chicago, Ill., manufacturer of reversible thread gages and centerless lapping machines. His office is at 7432 Brunswick, St. Louis, Mo.

#### Michigan and Wisconsin

ROBERT R. TELLER has joined Davis & Thompson Co., Milwaukee, Wis., as manager of the Detroit, Mich., office. He replaces the late Perry D. Gasnier. Mr. Teller was formerly in the production engineering department of the Ford Motor Co.

W. B. Duncan was recently appointed chairman of the board of directors of the Wesson Co., Detroit, Mich., manufacturer of carbide cutting tools, while E. MORTENSEN, vice-president in charge of manufacturing, was named president of the Wesson Tool Co., the post formerly held by Mr. Duncan. The chairmanship had become vacant with the death of Frank W. Archer, Jr., in December. Mr. Duncan joined the Wesson Tool Co. as president in 1941, and was instrumental in de-





LINDBERG ENGINEERING Co., Chicago, Ill., announces the removal of its Detroit office to new quarters at 1220 S. Woodward Ave., Royal Oak, Mich. Frank J. Condit is in charge.

DETROIT STAMPING Co., Detroit, Mich., recently completed its plant expansion with a new building providing 11,000 square feet of space.

CLARK EQUIPMENT Co., Buchanan, Mich., has begun construction of a 145,000-square foot building on the outskirts of Benton Harbor, Mich.

TAFT-PEIRCE MFG. Co., Woonsocket, R. I., has appointed the KEL-SIR Co., 2700 W. Concordia St., Milwaukee, Wis., as its agent in Wisconsin. The Kel-Sir Co. will handle the Taft-Peirce line of gages, small tools, and machine tools.

JOHN OSTER MFG. Co., Racine and Milwaukee, Wis., has announced the purchase of the CUMMINS PORTABLE TOOL DIVISION from the Cummins-Chicago Corporation.

#### **New England**

RICHARD L. WILCOX, president of the Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., has been elected chairman of the board to succeed DAVID C. GRIGGS, the retiring chairman. Mr. Wilcox joined the company in 1898; he held the office of president from 1947 to the present time. Mr. Griggs, who has been with the company since 1893, will continue as a director. JOSEPH M. SCHAEFFER, who was formerly a vice-president and director of the company and the chief engineer of



(Left) W. B. Duncan, new chairman of the board of directors of the Wesson Co. (right) E. Mortensen, president of the Wesson Tool Co.

#### **AGAIN REVERE SAYS:** "Copper is the metal of Invention !" Few people would consider it possible to melt titanium at a temperature of 3140°F, or above in a mold made of copper, a metal which melts at 1980°F. Yet it is being done on a production basis, and is helping in the work of making titanium metal available on a commercial basis. The secret lies in copper's high thermal conductivity. Molds made of Revere Copper by the Central Copper Works, Inc., Cincinnati, Ohio, have a Revere Copper baffle wrapped in a spiral around them. When installed in its jacket in the plant of Rem-Cru Titanium, Inc., Midland, Pa., the copper mold is connected to a source of high-velocity water. The high heat conductivity of the copper transfers heat so rapidly to the water spiraling along its surface that the copper never comes close to its melting point. High heat conductivity is only one of the qualities that make copper "the metal of invention." Copper is also easily workable, has the highest electrical conductivity of any commercial metal, does not rust, is easily soldered or brazed, and can be welded perfectly. The Revere Technical Advisory Service will gladly collaborate on any special problems concerning the application and fabrication of copper. Just get in touch with the nearest Revere Sales Office.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801 230 Park Avenue, New York 17, New York

Mills: Bultimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.: New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities. Distributors Everywhere.

SEE "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS

Fitanium ingat, 25° in diameter, 51° long, verishing 1,050 fbs., melted at 3140° F., and the vater-cooled copper mold, which would melt at 1980°F. If it were not for capper's high heat conductivity. The flange on the mold is steel, welded to the copper by the inert gas shielded are method, using silicon copper rod.

Announcing

#### THE WORLD'S MOST COMPLETE LINE



140 MODELS

to meet every quality control requirement

- STANDARD A.G.D. SERIES Four series No. 81 (A.G.D. Group 1), No. 25 (A.G.D. Group 2), No. 655 (A.G.D. Group 3), No. 656 (A.G.D. Group 4).
- REGULAR OR NONSHOCK New NONSHOCK mechanism available on all indicators (except .020", .400" and 1.000" ranges) completely absorbs impact and shock. Also balanced or continuous dials, jeweled or plain bearings, English or Metric graduations.
- LONG RANGE MODELS All long range indicators are direct reading... count hands read directly in decimals — no calculations.

Visit The STARRETT Exhibit BOOTH 211, ASTE SHOW

See these new Starrett Dial Indicators plus many new Starrett Precision Measuring Tools.



HIGH PRECISION — LOW FRICTION

#### DIAL INDICATORS

(Patents Pending)

NOW, from the pioneers in precision measuring, comes a new line of dial indicators combining improved design with all the dependable features of previous models, long known and accepted throughout industry for their accuracy and precision workmanship. Precision built throughout to American Gage Design specifications the complete new Starrett line offers 140 models to meet every requirement. New design, with outstanding new features to insure greater accuracy, sensitivity and repeatability; easier, faster reading; longer life and simplified maintenance — these are the finest indicators ever to carry the Starrett name.

#### SEND THE COUPON TODAY

for information on Starrett High Precision - Low Friction Dial Indicators.

THE L. S. STARRETT COMPANY, Dept. D. Athol. Massachusetts

Please send information on Starrett High Precision

— Low Friction Dial Indicators.

Name.....Title.....

Street and Number.....

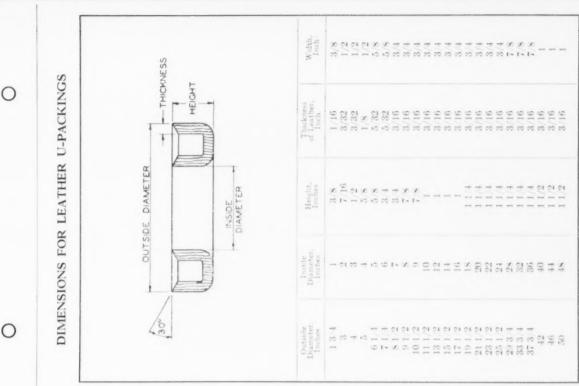
Starrett



"WORLD'S GREATEST TOOLMAKERS"

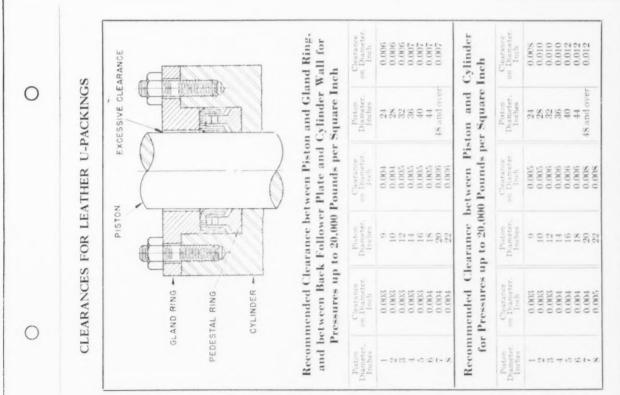
TOOLS AND PRECISION INSTRUMENTS - DIAL INDICATORS - STEEL TAPES
PRECISION GROUND FLAT STOCK - NACKSAWS, BAND SAWS and BAND KNIVES
THE L. S. STARRETT COMPANY, ATHOL, MASSACHUSETTS, U. S. A.

#### **MACHINERY'S DATA SHEETS 751 and 752**



MACHINERY'S Data Sheet No. 751, April, 1954

Compiled by the American Leather Belting Association

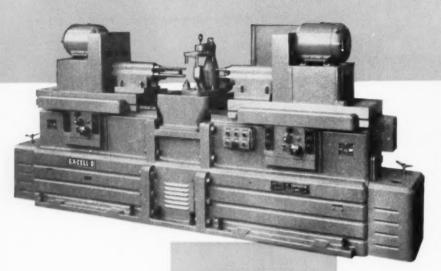


MACHINERY'S Data Sheet No. 752, April, 1954

Compiled by the American Leather Belting Association

## Modernize Today for Profits Tomorrow

WITH FAST, VERSATILE PRECISION WAY MACHINES



STYLE 58 TWO-WAY: Operates from a single push-button station. Handles large, heavy work. Fixture section can be designed to accommodate the way units from any angle.

Units may be re-arranged around fixture or new fixture sections designed for different operations.

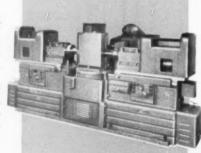
STYLE 54 ONE-WAY:
A standard way unit combined with a fixture unit to suit the work. Large, heavy, and awkward parts, loaded in the fixture, remain stationary; the spindles advance to the work.

EX-CELL-0

## WAY TYPE PRECISION BORING MACHINES ARE PROFIT INSURANCE

Way Machines perform such operations as precision boring, turning and facing. They consist of one or more standard way units combined with a fixture section. Each way unit has its own hydraulic system and controls to operate the spindle slide. Tooling and fixture are added to suit the individual operation. Get details from your Ex-Cell-O representative or write for Way Machine Catalog.

STYLE 54 THREE-WAY: Standard way units are electrically interlocked to operate simultaneously, or in any sequence. Fast and efficient for machining parts from three directions and holding accurate locations.



STYLE 58 FOUR-WAY: Controlled from a central push-button station. Particularly suitable for machining parts from four directions simultaneously, and performing progressive operations.



EX-CELL-O
CORPORATION
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES
CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS
AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT



the Bolt Nut & Screw Machinery Division, has been elected president. He began work with the company in 1905 as an apprentice machinist. Mr. Schaeffer is an authority in the field of cold process bolt, nut, and screw machinery. Also announced was the election of RICHARD C. BANNON, Cleveland office sales manager, as a vice-president of the company.

ROBERT H. WILKIE has been appointed supervisor of sales promotion for the New Departure Division of General Motors Corporation, Bristol, Conn., producer of ball bearings and bicycle coaster brakes. He will be responsible for advertising and will coordinate sales forecasts, market research, and sales training. Mr. Wilkie has been with the New Departure Division for the last seven years. Also announced was the appointment of MATTHEW C. WAGNER as supervisor of sales training.

FRANK J. COUGHLIN has been appointed to the newly created position of director of purchases of the Niles-Bement-Pond Co., West Hartford, Conn. He will direct the purchasing functions of both the Pratt & Whitney and Chandler-Evans Divisions.

ROGER W. KING has been made a representative in upper New York State and eastern Canada for the Horton Chuck Division of the E. Horton & Son Co., Windsor Locks, Conn.

CRUCIBLE STEEL CO. OF AMERICA. Pittsburgh, Pa., and NATIONAL RE-SEARCH CORPORATION, Cambridge, Mass., have announced jointly that Crucible has acquired half interest in the VACUUM METALS CORPORA-TION, also of Cambridge, formerly a wholly-owned subsidiary of National Research. The Vacuum Metals Corporation produces vacuum metal steels and other metals in commercial quantity. Arrangements have been completed for the construction of new vacuum melting facilities at the Syracuse, N. Y., plant of Crucible, including a furnace of 6000 pounds daily capacity. Vacuum Metals will also continue the operation of its present furnaces at Cambridge. Officers of the Vacuum Metals Corporation will be as follows: Chairman of the board, JOEL HUNTER (executive vice-president of Crucible); president, RICHARD S. MORSE (president of National Research); and vice presidents, L. L. FERRALL (assistant vice-president in charge of operations, Crucible) and ROBERT A. STAUFFER (vice-president and director of research of National Research). JAMES H. MOORE will be general manager, operations.

WILLIAM N. JOVE, a field engineer in the Chicago area for the Norton Co., Worcester, Mass., has retired after a career of over fifty-one years. Mr. Jove started with Norton as an errand boy at the Chicago store at the age of thirteen. Later he became a member of the outside sales force as an abrasive engineer and a field engineer. WILLIAM D. BENNETT, an abrasive engineer in Cleveland, has also retired after forty-six years of service. He will be succeeded by HARLAN W. COBB. who has been with Norton for thirtyseven years. Since 1929, Mr. Cobb has held several positions at Cleveland, and was most recently office manager. Also announced was the appointment of FRED J. BENN as abrasive engineer in Louisville, Ky., and a large portion of that state. This territory was formerly covered entirely by SHERWOOD F. PRESCOTT, who will continue in the Cincinnati area, southern Ohio, and eastern Indiana.

HY-PRO TOOL Co., New Bedford, Mass., tap manufacturer, announces an increase of approximately 50 per cent in manufacturing space.

Browne & Sharpe Mfg. Co., Providence, R. I., announces that its Philadelphia office has been moved to 7 Bala Ave., Bala-Cynwyd, Pa. John J. McAleese continues in charge.

#### New York and New Jersey

HOWARD ROBERTS has been named technical and sales representative for the Truarc Division of Waldes Kohinoor, Inc., Long Island City, N. Y. Mr. Roberts was formerly supervisor of Truarc production planning and control. In his new position, he will not only serve as a sales representative in the Long Island territory but as a representative of the Truarc technical service staff, traveling throughout the United States to assist manufacturers in the adaptation of Truarc products to particular manufacturing requirements. GUSTAV SCHROEDER, who was formerly Mr. Roberts' assistant, has succeeded him in the production planning post.

COSA CORPORATION, New York City, announces the appointment of six sales engineers in East Coast territories: LEROY OSBORN, Connecticut; JAMES McDonough, Long Island; CHARLES BURKE, New York City and Westchester; WILLIAM BUHL, northern New Jersey; ALBERT SCHLUMPF, southern New Jersey and Philadelphia, Pa.; and O. A. LINSE, Delaware, Maryland, Virginia, and Washington, D. C. Two dealers have also been appointed in New England: HICKS MACHINE, INC., Walpole, N. H., to cover Maine, New Hampshire, Vermont, Rhode Island, and eastern Massachusetts; and DR. WALTER RIESENFELD to handle sales in western Massachusetts.



Garvin A. Drew, new vice-president of Scovill Mfg. Co., Inc.

GARVIN A. DREW was recently appointed vice-president of the Scovill Mfg. Co., Inc., and will be in charge of sales, service, advertising, and sales promotion for A. Schrader's Son Division, Brooklyn, N. Y. Mr. Drew joined the Schrader organization in 1925, and was general sales manager at the time of his promotion.

WARNER & SWASEY Co., Cleveland, Ohio, announces the purchase of the INDUSTRIAL SCIENTIFIC Co., 34 W. 33rd St., New York City, and the formation of the WARNER & SWASEY RESEARCH CORPORATION to carry on, in expanded form, the work of the acquired company. Officers of the new corporation are CHARLES J. STILWELL, chairman; WILLIAM S. TANDLER, president; C. W. BLISS, treasurer; and E. B. GAUSBY, secretary. Mr. Tandler was formerly operating head of the Industrial Scientific Co., while the Messrs. Stilwell, Bliss, and Gausby are president, treasurer, and secretary, respectively, of Warner &

LAMSON CORPORATION, Syracuse, N. Y., manufacturer of conveyors, pneumatic tubes, loaders, and blowers, has just announced the formation of a department which will specialize in mechanical accessories for atomic energy power plants. Ross Atkinson, who was formerly shop superintendent, will head the new department. Karl C. Schmedicke replaces Mr. Atkinson as shop superintendent. Another appointment recently made was that of J. M. Ilacqua as field engineer in the Commercial Division.

PRODUCTION METALS, INC., 129 Pierreport St., Brooklyn, N. Y. has been organized by AUBREY L. Moss as a warehouse distributor of alumi-









(Left to Right) New managers of Cincinnati Milling & Grinding Machines, Inc.: Jack Lynch, standard milling machine sales—Kent Mathias, standard grinding machine sales—and Phil Hewett, special machine tool sales; and Ken Martin, sales manager, Machinery Division

num sheet, rod, tubing, coils, and allied items. Mr. Moss was formerly executive vice-president of the General Materials Co., Division of Crosby Products Corporation, which was dissolved in February. The majority of his former associates have joined Mr. Moss in this new enterprise. The company will also maintain separate departments for brass, copper, and stainless steel.

HANSON-WHITNEY DIVISION OF WHITNEY CHAIN Co., Hartford, Conn., has appointed the MACAULAY MACHINERY Co., INC., as representative for the Hanson-Whitney line of machine tools in northern New York State. The representative is located in the Sibley Tower Bldg., 25 North St., Rochester, N. Y. In western New York, the FISGUS MACHINERY Co., 30 Goodrich St., Buffalo, N. Y., has been appointed.

Morey Machinery Co., Inc., announces the removal of its executive office from 410 Broome St., to 383 Lafayette St., New York 3, N. Y. The new office presently occupies 10,000 square feet of floor space; Morey expects to occupy the ground floor of the building as a show room for the display of machine tools before the end of the year.

DAKON TOOL & MACHINE Co., INC., manufacturer of Quadro precision live centers, is moving to a new building at 1836 Gilford Ave., New Hyde Park, Long Island, N. Y.

THOMAS H. BRUMAGIN has been made chief engineer of the Ajax Flexible Coupling Co., Inc., Westfield, N. Y. He has been in the engineering department for seven years.

METALLIZING ENGINEERING Co., INC., Long Island City, N. Y., has announced plans for a new plant at Westbury, Long Island, N. Y., to occupy 65,000 square feet of office and manufacturing space.

OAKITE PRODUCTS, INC., New York City, announces that its research and service laboratories is moving to larger quarters at 350 Hudson St., New York City.

MICROMAX Co., Brooklyn, N. Y., has changed its name to the Computer Instruments Co. The concern will continue manufacturing at 1964 Utica Ave.

Morell C. Smith has joined the engineering staff of the Sage Equipment Co., Buffalo, N. Y., conveyor manufacturer.

C. H. HARTLEY has joined Servomechanisms, Inc., Garden City, N. Y., in the capacity of sales director.

NORD INTERNATIONAL CORPORA-TION, Denville, N. J., has opened a plant at 449 Central Ave., Orange, N. J., where the main office will now be located, as well as the experimental and the developmental departments.

ERIC B. T. KINDQUIST has become vice-president and general manager of the Garfield Wire Division of the Overlakes Corporation, Garfield, N. J. MELVIN SCHWARTZ has joined the Division as general sales manager.

JAMES O. JOHNSON has been named general sales manager of the Buchanan Electrical Products Corporation, Hillside, N. J.

#### Ohio

CINCINNATI MILLING & GRINDING MACHINES, INC., Cincinnati, Ohio, sales subsidiary of the Cincinnati Milling Machine Co., announces a

new domestic selling organization to provide better customer service, as follows: JACK LYNCH, formerly manager of the New York office, will now be manager of standard milling machine sales, serving on the staff of CARL M. BEACH, vice-president and domestic sales manager; KENT MATHIAS, formerly assistant to the sales manager, will now be manager of standard grinding machine sales; PHIL HEWETT, who was manager of engineering service, has been assigned to the Special Machine Tool Division where he will be manager of special machine tool sales; and KEN MARTIN, who was in the Machinery Division, will now be sales manager of that Division, responsible for Hydroform deepdrawing machines, Flamatic hardening machines, and allied equip-

RELIANCE ELECTRIC & ENGINEER-ING Co., Cleveland, Ohio, manufacturer of electric motors and power drives, is adding another plant to its Ashtabula, Ohio, Division. The building will be a 90,000-square foot structure, and will be used to produce the company's new line of alternating-current motors.

LEE C. SASSMANHAUSEN has been named works manager of the Liberty plant at Warren, Ohio, of the Mullins Mfg. Corporation. EARLE L. SCOTT has been made assistant works manager. He was formerly head of the production planning department, this position now being filled by RALPH KNEPPER.

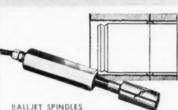
MICHIGAN OVEN Co., Detroit, Mich., designer of ovens for industrial heating and processing, announces the appointment of the J. R. ENGLE Co. as representative in Cleveland and northeastern Ohio. This company, operated by Joe R. Engle, is located at 1900 Euclid Ave., Cleveland.



# Modernize FOR LOW COST PRODUCTION with Newest Developments In Air Gaging

Already these newly developed practical precision tools are helping produce more and better products at lower cost in innumerable plants throughout the world.

Space restrictions here preclude anything more than the briefest description. Phone, wire or write for specifications, prices and delivery—or call the Sheffield sales engineer in your vicinity.



For checking holes having finishes rougher than 65 micro-inches. for porous parts, narrow lands or checking to the very end of a hole. Setting is made with gage blocks and a Standard Calibrator. NO MASTER SETTING RINGS REQUIRED—not even one.



One, two, three or four spindles may be quickly assembled from components in the kit, for any size between 1 and 3 inches. Gage blocks are used to set for size and to calibrate air gage for amplification.



ADJUSTABLE AIR BORE GAGE

A light, high precision (2,000 to 1 amplification) self-centering bore gage that is easily adjustable from 3" to 12" in diameter, Calibrated by a Standard Calibrator and gage blocks.



AIRETEST INDICATOR

Replaces an indicator where more accuracy and higher amplification are required. Always gives precise readings regardless of the direction of approach. No lag—no gears—nothing to wear out of adjustment. Amplifications up to 5,000 to 1.



AIRELECTRIC HEAD

Converts air pressure variations at the gaging contact into electrical impulses which actuate classification and segregation mechanisms or machine control devices. Accurate to a fraction of a "tenth".

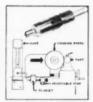


ELECTRO-PNEUMATIC UNIT

A self-contained unit of Airelectric Head, indicating dial and signal lights. Easily mounted on the machine to control machine operation by precision measurement of the machined surface. Makes machining automatic. Also used for automatic gaging and segregating.

PLUNJET

The key element of the machine "Feed Gage" which eliminates error due to feed screw wear. Also, due to the high amplification, makes it easy to manually control the feed to fractional



PLUNJET CALIPER TYPE

GAGE
Air Gaging Cartridges
are used with Caliper
Gages for continuous
sizing of work on external grinders. Dial
is used for approach
—PLUNJET brings to



EX.

PLUNJET GAGING CARTRIDGES



Precise, low-cost gaging elements which you may incorporate in your own gaging fixtures singly or in multiple to measure practically any dimension or geometrical relationship, with tolerances ranging from 0005 to 100.

GAGE DIVISION, The Sheffield Corporation Dayton 1, Ohio, U.S.A.



HEFFIELD

PHONE, WIRE OR WRITE



Paul W. Norris, director of sales for the Denison Engineering Co.

PAUL W. Norris has been appointed director of sales for the Denison Engineering Co., Columbus, Ohio, manufacturer of hydraulic presses and components. Mr. Norris has been with the company for twenty years, having served as sales manager in the Pump and Control, Division, chief engineer and sales manager in the Multipress Division, and manager of the Research and Development and Marketing Divisions. He will now have complete supervision of all domestic sales, advertising, and service and sales promotional activities. Also announced was the promotion of Ros-ERT H. KREPPS to sales manager, and the appointment of ROBERT R. HY-ATT as director of industrial relations.

CRUCIBLE STEEL Co. of AMERICA, Pittsburgh, Pa., has opened a field office located at 81 E. State St., Columbus, Ohio. D. W. STURGES, sales engineer, has been assigned to the new office from Cleveland.

PRESSED METAL INSTITUTE, national association for the metal stamping industry with headquarters in Cleveland, Ohio, has appointed HAROLD A. DASCHNER as assistant manager.

NATIONAL MACHINE TOOL BUILD-ERS' ASSOCIATION announces its removal from 10525 Carnegie Ave. to 2071 E. 102nd St., Cleveland 6, Ohio.

#### Pennsylvania

JAMES K. WATKINS has joined the Crucible Steel Co. of America, Pittsburgh, Pa., in the capacity of chief engineer at the Midland, Pa., works replacing JOHN FERM, chief engineer since 1927, who has retired.

Mr. Watkins had served as chief engineer of the Monessen Works of the Pittsburgh Steel Co. since 1944, previous to this assignment having been chief draftsman and plant engineer. Mr. Ferm. who served Crucible for thirty years, was primarily responsible for the engineering involved in the \$70,000,000 expansion and improvement program at the Midland Works since World War II. Also announced was the appointment of CHARLES A. GRIM as assistant product manager of the Cold Rolled Division, New York City. Mr. Grim, who joined the sales department of this Division in 1953, will now do sales service and development work in the company's Eastern

FIRTH STERLING INC., Pittsburgh, Pa., recently announced the appointment of four distributors for its steel and carbide products: DENMAN & Davis, 2038 83rd St., North Bergen, N. J.; O'NEAL STEEL Co., 745 41st St., Birmingham, Ala.; MAU-SHERWOOD SUPPLY Co., 800 Lime Road, Cleveland, Ohio; and STANDARD-SHANNON SUPPLY Co., 13 S. Letitia St., Philadelphia, Pa. Also announced by Firth Sterling Inc. at this time was the election of DONALD G. CLARK as a director of the company. Mr. Clark was a vicepresident and a director from 1928 to 1945 when he retired from active management. For the last few years he has served in a consulting capacity.

EUGENE C. CLARKE, JR., vicepresident of the Chambersburg Engineering Co., Chambersburg, Pa., has been advanced to general manager of the company, assuming the duties of general administration. This change is the result of expanding the engineering services of the



Eugene C. Clarke, Jr., vice-president, Chambersburg Engineering Co., who has become general manager

company, on which the president will concentrate. KENNETH W. PALMER has been named vice-president, and will continue as treasurer; C. DOUGLAS GALLOWAY, III, has become secretary and works manager; and GEORGE H. MARTIN has been appointed foundry superintendent.

WILLIAM T. MARTIN, formerly manager of the Indianapolis, Ind., office of the Landis Tool Co., Waynesboro, Pa., has been transferred to the home office, while JOHN MOURER will succeed Mr. Martin at Indianapolis. Mr. Mourer was formerly head of the Pittsburgh office. ECKLEY SCHATZMAN will be in charge of the Hartford, Conn., office, succeeding JOHN SCHOBINGER, who has joined the sales staff of the Gardner Machine Co., Beloit, Wis.

FRANCIS J. KINSELLA has been named manager of outside sales by the Standard Pressed Steel Co., Jenkintown, Pa., manufacturer of metal fasteners, precision aircraft specialties, and shop equipment. Mr. Kinsella, who was midwest regional sales manager for the company, moves to the post vacated by GEORGE A. GADE last year when he was elected vice-president in charge of sales. Mr. Kinsella has been with the company for eighteen years.

RANSOM A. JOHNS has been promoted to general sales manager of the Detroit Tube & Steel Division, Detroit, Mich., of the Sharon Steel Corporation, Sharon, Pa. Prior to this, he was assistant manager of sales. ROBERT I. PETRIE has been named manager of the order department at the Detroit plant.

George E. O'Brien has been named factory manager at the new water meter plant, Uniontown, Pa., of the Rockwell Mfg. Co., Pittsburgh, Pa. Mr. O'Brien joined Rockwell in 1934-and at the time of his appointment was manager of purchasing and production at the company's National Meter Division in Brooklyn, N. Y.

C. PAUL PORTERFIELD, chief engineer of the Method X Co., an affiliate of Firth Sterling, Inc., Pittsburgh, Pa., has been elected vice-president and general manager of the company, which designs electromechanical machining equipment.

WILLIAM ADAM, JR., was recently elected president of the Ajax Electric Co., Philadelphia, Pa., manufacturer of electric heat-treating furnaces. Dr. G. H. Clamer, who held this post, has retired, although he will continue as president of three other Ajax corporations. JOHN E. HAIG and LEON B. ROSSEAU were elected vice-presidents.

OMAR V. GREENE has been appointed general sales manager of the





### WESSON METAL CORPORATION

LEXINGTON 34, KY.
Affiliated with WESSON COMPANY, Detroit, Mich.





(Left) Omar V. Greene, general sales manager of the Carpenter Steel Co. (Right) John W. Thompson, manager of sales development

Carpenter Steel Co., Reading, Pa. He joined the company in 1928 as a metallurgist, and in 1940 became manager of tool and alloy steel sales. He then served in Reading as assistant general sales manager and manager of product development. At the time of his present appointment, Mr. Greene was New England manager, with headquarters in Hartford. Conn. Also announced was the appointment of JOHN W. THOMPSON as manager of sales development, a new staff assignment. Mr. Thomp-son, who has been with Carpenter since 1939, most recently as product manager, will work with the company's field representatives in the promotion of new and special products. Assistant managers who have been promoted to branch managers are as follows: F. J. McCarty, Jr., at Hartford, Conn.; J. D. NELSON, at Providence, R. I.; and F. J. WEL-DON, at Bridgeport, Conn.

James N. Alcock, of the Saginaw Welding Supply Co., Saginaw, Mich., was elected president of the National Welding Supply Association, Philadelphia, Pa., at its tenth annual convention, recently held in San Francisco. The meeting was attended by 375 distributors and manufacturers.

HARRY R. CHASE and RAYMOND L. MORELAND, who have been associated with the Pittsburgh, Pa., district sales office of the Hydraulic Press Mfg. Co., Mount Gilead, Ohio, have been made sales engineers.

JAMES E. COMPTON has joined the Wesson Co., Detroit, Mich., manufacturer of carbide cutting tools and has been assigned to field engineering in the Pittsburgh area.

H. J. KALBERKAMP has been named chief engineer of the Mesta

Machine Co., Pittsburgh, Pa., while C. P. MAYER has been made manager of sales.

### Washington, D. C., and Delaware

AMERICAN GEAR MANUFACTURERS ASSOCIATION announces the removal of its headquarters from Pittsburgh, Pa., to One Thomas Circle, Washington 5, D. C. GERALD L. SCOTT is the newly appointed staff engineer; and ROBERT F. KLOSE and JOHN C. SEARS will continue as office manager and executive secretary, respectively.

LOBDELL UNITED Co., Wilmington, Del., subsidiary of the United Engineering & Foundry Co., Pittsburgh, Pa., announces that it has purchased from the Lodge & Shipley Co., Cincinnati, Ohio, the Bridgeport and Diamond lines of grinding and abrasive cut-off machines. These lines were formerly manufactured by the Bridgeport Safety Emery Wheel Co. and the Diamond Machine Co. of Bridgeport, Conn., and by the Columbia Division of the Lodge & Shipley Co., Hamilton, Ohio. Knife grinders, vertical and horizontal facing grinders, and a number of special-purpose grinders make up the grinding line, while abrasive cut-off saws of manual, semiautomatic, and fully automatic types make up the saw line.

Ruthenium, one of the precious platinum group metals, must be heated to a temperature of approximately 4530 degrees Fahrenheit before it will melt. This is over seven times the temperature required to melt lead.

## Coming Events

APRIL 26-28—1954 Metal Powder Show and Tenth Annual Meeting sponsored by the METAL POWDER ASSOCIATION, to be held at the Drake Hotel, Chicago, Ill. For further information, write to the Association, 420 Lexington Ave., New York 17, N. Y.

APRIL 26-30—Tenth Biennial Industrial Exposition of the AMERICAN SOCIETY OF TOOL ENGINEERS to be held at Convention Center in Philadelphia, Pa. Executive secretary, Harry E. Conrad, 10700 Puritan Ave., Detroit 21, Mich.

MAY 4-7—National spring technical meeting of the AMERICAN WELDING SOCIETY to be held at the Hotel Statler, Buffalo, N. Y., in conjunction with the Second Welding and Allied Industry Exposition at the Buffalo Memorial Auditorium. National secretary, J. G. Magrath, 33 W. 39th St., New York 18, N. Y.

MAY 17-20—SECOND BASIC MATERIALS EXPOSITION AND CONFERENCE to be held at the International Amphitheatre, Chicago, Ill. For further information, write to Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

MAY 31-JUNE 11—Seventh CANADIAN INTERNATIONL TRADE FAIR to be held at Exhibition Park, Toronto, Ontario, Canada. For further information, write to C. C. Hoffman, Trade Fair Administrator.

JUNE 6-9—Annual meeting of the AMERICAN GEAR MANUFACTURERS ASSOCIATION to be held at the Homestead, Hot Springs, Va. Executive secretary, John C. Sears, One Thomas Circle, Washington 5, D. C.

JUNE 7-10—Sixth National Plastics Exposition sponsored by the SOCIETY OF THE PLASTICS INDUSTRY, INC., at the Public Auditorium in Cleveland, Ohio. Chairman, P. H. Grunnagle, Society of the Plastics Industry, Inc., 67 W. 44th St., New York 18, N. Y.

JUNE 9-11—Eighth Annual Convention of the AMERICAN SOCIETY FOR QUALITY CONTROL to be held at the Jefferson Hotel, St. Louis, Mo., with technical sessions at the Kiel Auditorium. Further information can be obtained from U. C. Gramsch, Registrar, Box 4436, Wade Station, St. Louis 15.

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By the use of high electrical voltage Metalmaster has given its user the power and speed to cut the hardest metals man has been able to produce . . . This we call DISINTEGRATION for it actually disintegrates the metal without affecting the hardness.

Metalmaster Disintegrators save thousands of dollars each month for their users through the salvage of workpieces normally going into scrap.

One firm alone through the use of two Metalmasters saves annually over \$70,000.00 in just tool and die repair alone.

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IMAGINE, for a moment, the potential . . . if you could save that enormous scrap pile of workpieces with broken taps, drills, reamers, etc. You can do it with Metalmaster . . . in a matter of minutes per part.

!MAGINE, for a moment, the potential . . . of a machine that in many cases saves its initial cost in just one free demonstration in a customer's plant. This is a common occurrence with Metalmaster.

For information relative to the many machines available for your type operation and the many advantages Metalmaster can offer your firm, write today on your company letterhead to:

METALMASTER DIVISION: CLINTON MACHINE COMPANY CLINTON, MICHIGAN



### Obituaries

### Frederick U. Conard

Frederick U. Conard, president and general manager of the Pratt & Whitney and Chandler-Evans Divisions of Niles-Bement-Pond Co.,



Frederick U. Conard

West Hartford, Conn., and president of the Potter & Johnston Co., a subsidiary, Pawtucket, R . I., died suddenly on March 14 at his home in West Hartford. He was sixty-three years old. Mr. Conard was born in Brooklyn, N. Y., and received his M.E. degree from the Stevens Institute of Technology. After serving in France with the Chemical Warfare Division in World War I, he became associated with the Underwood-Elliott-Fisher Co. in 1919. He served this company for twentyeight years in various executive capacities. In 1947, he was elected president of the Niles-Bement-Pond Co. Mr. Conard is survived by his wife and four sons.

### Lester F. Nenninger

Lester F. Nenninger, assistant manager of the Machine Tool Division of the Cincinnati Milling Machine Co., and vice-president of its sales subsidiary, Cincinnati Milling & Grinding Machines, Inc., Cincinnati, Ohio, died suddenly on March 16 at the age of fifty-nine years. Mr.



Lester F. Nenninger

Nenninger joined the Cincinnati Milling Machine Co. in 1912, starting as a tool and fixture designer. He advanced to machine tool designer, assistant in charge of machine tool design, and, in 1926, was appointed chief engineer. In 1943, he became works manager, and in January of this year was appointed to the position he held at the time of his death. Mr. Nenninger was active in the American Society of Mechanical Engineers and several other engineering societies. He was also a member of a standardization committee of the National Machine Tool Builders' Association. Mr. Nenninger was widely known throughout the machine tool industry.

### Machine Tool and Lubrication Technology

A Special Summer Program of interest to the users and builders of machine tools will be given at the Massachusetts Institute of Technology from June 15 to 25. It will cover a number of fundamental topics concerned with the design, use, and evaluation of machine tools; the elements of fine measurement; and the principles of statistics and quality control. Lectures and demonstrations concerned with machine tool control systems, alignment problems, and vibrations and their isolation will be presented by members of the staff of the Machine Tool Division

of the Mechanical Engineering Department and other distinguished specialists.

Another Special Summer Program, in lubrication engineering, will be held during the same period. Intended primarily for plant engineers responsible for lubrication, it will be suitable also for chemists and others in the petroleum industry, and engineering students who wish to become better acquainted with the field of lubrication engineering. Following an introductory survey on friction and lubrication, lectures are scheduled on such topics as hydrodynamic

lubrication, bearing design and materials, fluid and solid lubricants, dry and boundary friction and wear, metal-cutting fluids, lubrication of rolling-contact bearings, gear lubrication, lubrication of complex mechanisms, lubricating systems, and plant maintenance. Several evening sessions are planned for the showing of pertinent films and for general discussion. Visits to various M.I.T. laboratories will be arranged.

From August 23 to September 3, a Special Summer Program will be held in the Institute's servomechanisms laboratory concerning the automatic control of machine tools. Topics include information processing as applied to machine tools; numerical control systems; servomechanisms for machine tool control; design considerations for system reliability; and management, operation, and maintenance of numerically controlled machine tools. Afternoon sessions will be devoted to programming techniques, using the numerically controlled milling machine developed in the servomechanisms laboratory under sponsorship of the United States Air Force.

For additional information, write to Summer Sessions Office, Room 7-103, Massachusetts Institute of Technology, Cambridge 39, Mass.

### Ultrasonic Inspection Film Available

"Ultrasonic Inspection," a tenminute, sound-color, educational film describing the development, theory, operation, and application of the Sperry ultrasonic Reflectoscope for non-destructive testing of metals and other materials, has just been released by Sperry Products, Inc., Danbury, Conn. Latest techniques in ultrasonic testing of raw stock, finished parts, and plant equipment are illustrated. Scenes were taken in Sperry's research laboratories and in several manufacturing plants where this instrument is being applied.

Included in the motion picture are excerpts from a Heppenstall Steel Co. film on ultrasonic inspection of die-blocks and also from a Wyman-Gordon film on ultrasonic inspection, at various stages of fabrication, of highly stressed parts for supersonic aircraft. The film also describes recent developments in immersion testing with Sperry "Simac" installations, whereby metal parts are inspected ultrasonically and the results recorded automatically.

The film is available for showings to interested industry, trade, and technical groups, as well as technical and engineering societies, schools, and colleges. Prints can be obtained by writing to the company.



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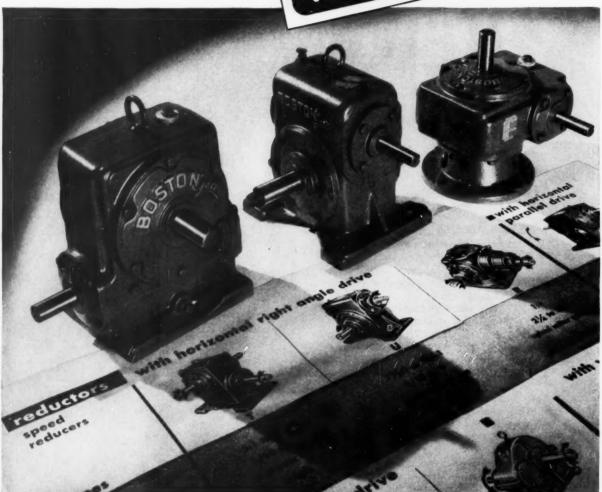
MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT





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It's good sales sense to specify BOSTON Gear REDUCTORS or RATIO-MOTORS when your product's design calls for speed conversion. BOSTON Gear is a name your prospects know and trust. It's also your lowest cost insurance of customer satisfaction . . . and repeat orders. Here's why:

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- 6. **NEARBY STOCKS** at leading supply centers . . . the nation-wide network of 92 BOSTON Gear Distributors . . . with stocks totaling \$10,000,000.

These are more than advantages . . . they are essentials to trouble-free planning and servicing of any product assembled with standardized stock parts. Only BOSTON Gear offers them all. Compare — and you'll agree — it pays to "Design around BOSTON Gear."

For advice on speed conversion problems, talk with a specialist, the BOSTON Gear Field Engineer. Ask your BOSTON Gear Distributor to arrange a call, or write: Boston Gear Works, 65 Hayward Street, Quincy 71, Mass.

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TRACER LATHE TURNS ARMATURE SHAFT AS JACOBS COLLET CHUCK HOLDS WORK RIGID.

# **COLLET PERFORMS GRIPPING FEAT**

Rubber-Flex Collet jaws close down on work with parallel bearing that defies slippage

International Equipment Company in Brighton, Massachusetts has high praise for a unique collet it uses. The collet daily delivers the tightest, most accurate grip ever devised in lathe collet equipment — 2 to 4 times the gripping power of split steel collets.

This Jacobs Rubber-Flex Collet, the heart of the Jacobs Spindle Nose Lathe Collet Chuck, provides an absolutely parallel grip over the entire bearing surface. Its multiple, long steel jaws are locked together with oil resistant synthetic rubber and offer a length of bearing that is 50–75% greater than can be obtained in split steel collets.

The full  $\frac{1}{8}$ " range of the collet permits chucking bars with variable outside diameters.

"Eleven of these collets have the gripping range of eighty-eight split steel collets," points out Evan Anderson, Assistant Foreman, Maintenance Division.

The collet's radically different construction is considered, by tool engineers, one of the most outstanding developments in modern tool history. Jacobs Spindle Nose Lathe Chucks, known all over the world, are stocked and sold by your Industrial Supply Distributor. The Jacobs Manufacturing Company, West Hartford 10, Connecticut.



SHAFT IS INSERTED AT AN ANGLE by Walter B. Best, operator. This is allowed by the flexibility of the collet and greatly reduces tailstock resetting adjustment.



COLLET GETS IMPACT TIGHTENING. Handwheel hammer lugs deliver an impact blow on impact sleeve inside handwheel. Force exerted is several times greater than in ordinary hand tightening.

JACOBS SPINDLE NOSE LATHE CHUCK permits use of maximum speeds and feeds on modern tool room lathes. Chucks any bar between  $\frac{1}{16}$ " and  $\frac{1}{16}$ ". The world's finest collet chuck.

JACOBS

## Jacobs and your local distributor

are ready to deliver the chucks you need and the service you deserve.

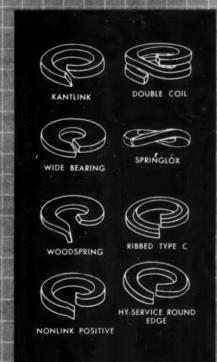
- . . . first in chucks
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## Keep Bolted Assemblies

### Tighter Longer



Reliance Spring Lock Washers are designed and manufactured to combat the natural enemies of bolted assemblies; i.e., vibration, shock, twist, wear, expansion, contraction and bolt elongation. It is little wonder, therefore, that you find Reliance Spring Lock Washers on everything from toasters to tanks, from lathes to locomotives. They are specified by designers and production men because of the non fatiguing properties of the cold drawn spring steel. Their helical coil design also provides

maximum reactive tension with a wide range of reaction. Reliance Spring Lock Washers help create more confidence in your product because they help keep bolted assemblies tighter longer.

SEND FOR ENGINEERING FOLDER W-50

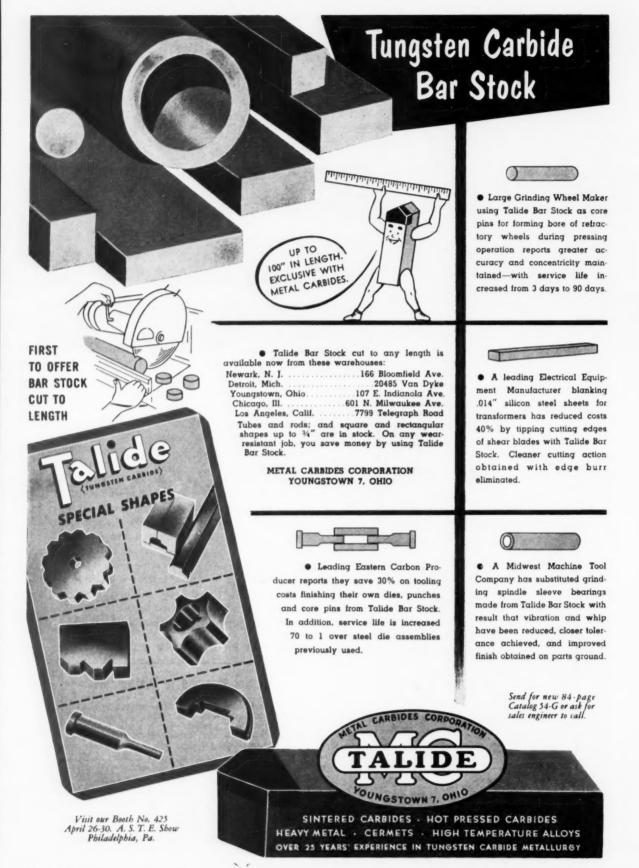
### Special Message to Distributors

We are looking for distributors to handle the Reliance Spring Lock Washer line. If you are interested in a product with a profit potential and wide acceptance, backed up with national advertising, write for more information today.



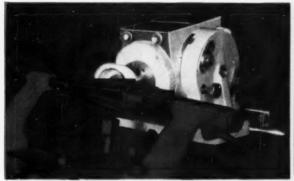
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# Specify This New POPE SUPER PRECISION 1 HP, 3600 RPM MOTORIZED TOOL AND CUTTER GRINDER CLEARANCE ANGLE SWIVELLING HEAD

With Angular Adjustment In A Vertical Plane





### TIME AND MONEY SAVING FEATURES:

- 1. Cup wheels, generally considered best for cutter grinding, can be used for practically all clearance angles on this new head.
- 2. Cup wheels produce a cutting edge on tools that lasts longer because it is stronger.
- The tooth rest remains on the center line of the cutter for practically all grinding on centers or in the work head.
- Most cutters, and reamers can be ground all over with one set-up, using the swivelling table and Pope tilting head. The usual second and third set-ups are no longer required.
- All clearance angles read directly in degrees from the scale provided on the head.
   Mistakes on clearance angles are avoided.
- The right clearance angle is assured on tools difficult to grind, such as slab mills, taper reamers, angular cutters and form tools.
- 7. 3600 R.P.M. one wheel speed safe for all wheels generally used on cutter grinders. Heat checking of cutters is virtually eliminated.
- The operating ease and convenience of this new Pope Head with the angular adjustment in the vertical plane saves you time and money on every tool you grind.

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CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.

292-MACHINERY, April, 1954

For more information on products advertised, use Inquiry Card, page 261

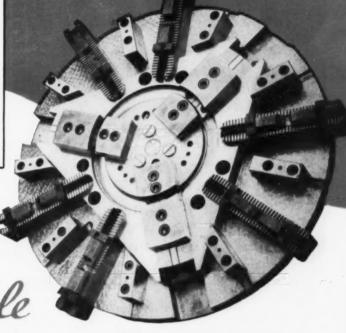
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to hold jet engine discs and rings while being machined to exceedingly close tolerances. These jet engine parts, vital to our country's air arm, presented a major work-holding problem because of their large size and extremely small cross section. Until Cushman developed these special chucks, most forms of work-holding devices caused severe distortion difficulties. Design and engineering service such as this is always available to industry through the Cushman Engineering Department. Find out what Chuck-Ability can do for you . . . write Cushman for Special Data Book No. 852 describing Cushman Wheel and Ring Chucks.

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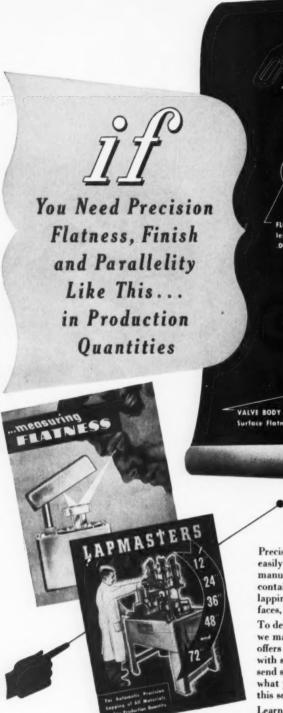
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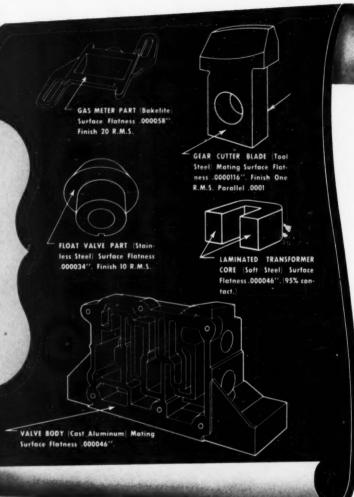
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Air Operated Chucks, Cylinders, and Accessory Equipment...The Cushman Power Wrench... Cushman Manually Operated Chucks and Face Plate Jaws.

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Precision flatness and finish as shown in the drawings can be obtained easily with the Lapmaster and, at high production rates. In addition manufacturers of pumps, compressors, valves and other equipment containing liquids or gases under pressure are now using production lapping to great advantage—have eliminated gaskets in mating surfaces, have improved product performance.

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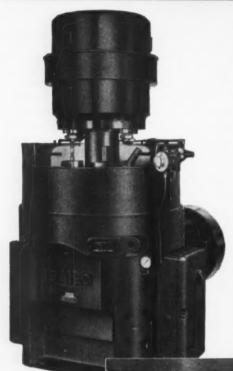
UNION TWIST DRILL COMPANY . ATHOL, MASSACHUSETTS

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# TOOLS MOVE HORIZONTALLY, OTHERS VERTICALLY, FOR FACING . . . TURNING

... and that's but one of the excellent features of Baird's No. 54VC (5" chuck, 4-spindle, vertical continuous lathe). As the turret revolves, eliminating unproductive indexing time, holding fixtures grip and release automatically for easy loading and unloading. Tools feed in and out of the cutting stroke.

This typical Baird tooling set-up bores the hole, faces and chamfers the hub, and turns the flange of a generator end plate. Cycle time 19.48 seconds, 5 seconds per piece, 720 per hour. Feed: boring hole and facing hub .0039" . . . turning flange .005" and .002" (forming tools). Cutting speeds: boring 348 ft.; turning 1985 ft. per minute.

Safety for operator and prevention of machine and product damage are mechanically and electrically controlled; tools cannot feed to work unless

spindles are revolving; electrical equipment is enclosed, wiring concealed.



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BEFORE AND AFTER

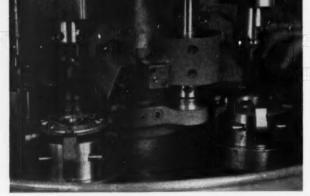
# FEATURES BAIRD 4-SPINDLE VERTICAL LATHE

- 1. Compact design.
- 2. Easy to tool and operate.
- 3. Simple . . . dependable.
- 4. Extremely accurate.
- 5. Unusually versatile.
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Installation of Baird automatic machines is a step in the right direction against tough competition. "Ask Baird about it!"

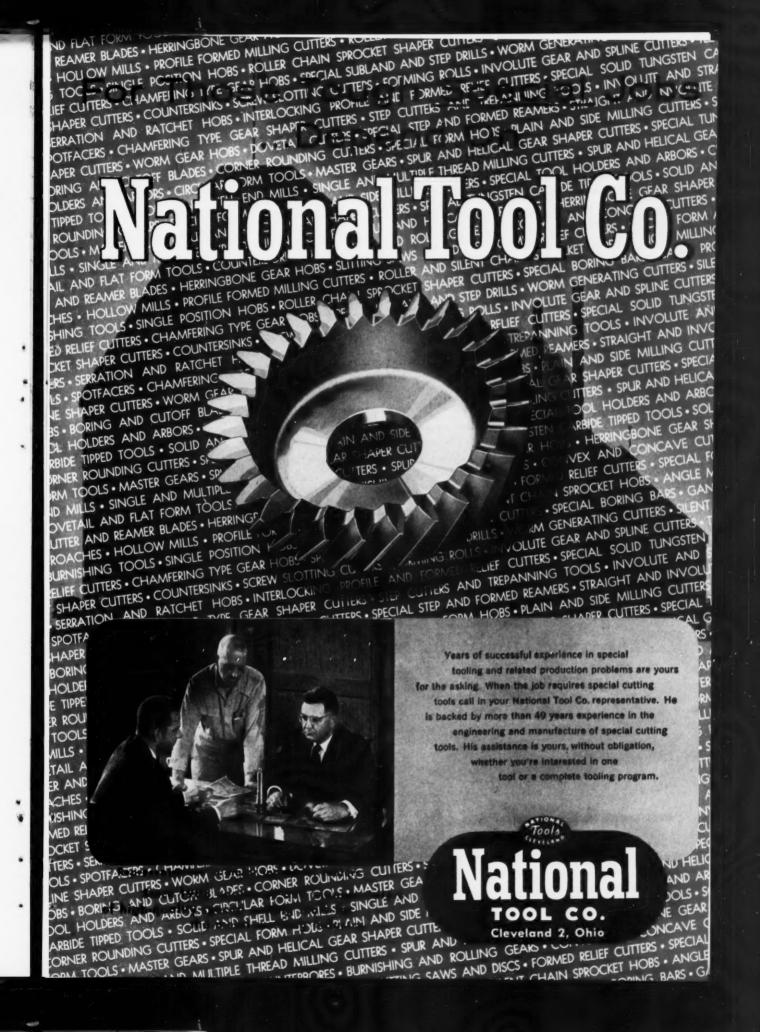
(Above) Front view, showing splosh guards for wet cutting.

(Right) Tooling set-up for finishing a generator end plate.



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AUTOMATIC MACHINE TOOLS - AUTOMATIC WIRE & RIBBON MEYAL FORMING MACHINES - AUTOMATIC PRESSES - TUMBLING BARRELS



# ON III INDIVIDUAL LEAD SCREW TAPPERS WITH SHAVED GEARS AND THE PATENTED SAFETY TAP HOLDER

The U. S. **Safety Tap Holder** is the only Tap Holder which automatically resets the spindles for continuous machine cycling while preventing tap breakage due to bottom tapping, dull taps or holes not drilled.



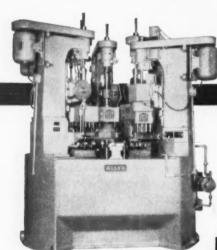
This machine drills, reams, chamfers and taps holes in a crank shaft for a farm tractor engine using a U. S. combination head, having individual lead screws with the U. S. Safety Tap Holder at the tapping station.



This complete tapping machine has provisions for a fifth U. S. Head to be added at a later date. All lead screw tappers are equipped with shaved gears and the U. S. patented Safety Tap Holders.

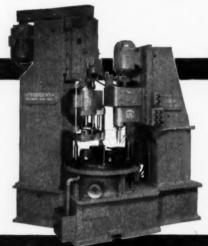
### FOSDICK MACHINE TOOL CO., Cincinnati, Ohio

Combination drill and tapping machine still in use after many years, at an automotive accessory plant. Operation performed on a motor sheave.



### CHARLES G. ALLEN CO., Barre, Mass.

This machine has operated 16 hours per day since 1950, performing a bottom tapping operation in every cycle without a replacement part required on any portion of the lead screw spindle.



#### AGNEW ELECTRIC CO., Milford, Mich.

case of a tank engine.

A complete tapping machine having a total of 76 spindles. One 38 spindle, one 20 spindle and one 18 spindle U. 5, individual lead screw tapper. Straight threads  $\frac{1}{4}$ -20 to  $\frac{1}{2}$ -13 and tapered pipe  $\frac{1}{6}$ - $\frac{3}{4}$  class #3 thread were produced in the accessory  $_T$ 



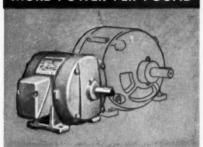
U. S. DRILL HEAD CO., 616-618 Burns St., Cincinnati 4, Ohio

8 reasons why you should

## MODERNIZE EQUIPMENT WITH TRI 55 CLAD MOTORS

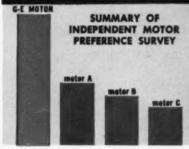
Plan now to modernize your equipment with the all-new General Electric Tri Clad '55' motor, available now in many ratings; entire line of 1 to 30 hp a-c motors available soon. Contact your G-E Representative. General Electric Company, Section 648-6, Schenectady 5, N. Y.

### MORE POWER PER POUND



Lighter and smaller Tri/Clad '55' motors in new NEMA frame sizes and ratings save you space and weight, reduce handling costs.

### **BUYER PREFERENCE**



You take advantage of a 2 to 1 buyer preference for the electric motors on your equipment when you buy or specify a G-E motor.

### BETTER PERFORMANCE



Quieter operation, proved by sound-room tests, is typical of the many performance improvements in the new G-E Tri/Clad '55'.

### LONGER LIFE



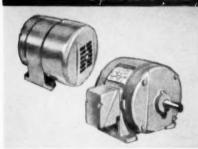
A silicone Dri-film\* coating makes insulation shed water-lengthens motor life. Polyester-film insulation is 8 times stronger.

### INSTALLATION

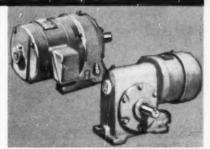


Perma-numbered leads are always instantly read even when wires are taped or clipped. Conduit box has plenty of knuckle room.

### COMPLETE LINE OF NEW MOTORS



A complete line of new motors assures the right electrical drive for your machine. Write for Bulletin GEA-6013 on dripproof motors,



GEA-6012, on enclosed motors. For low G-E service is as close as your telephone, speed jobs, G.E. offers a complete line of Authorized motor service stations provide gear-motors. Write for Bulletin GEA-6027. repair-facilities in all major trading areas.

### NEAR-BY SERVICE



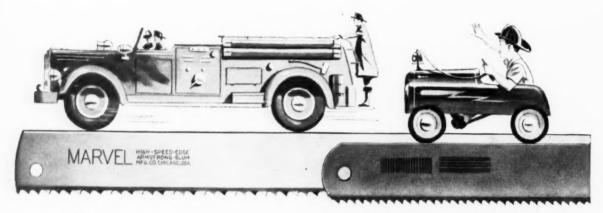
\*Reg. trade-mark of General Electric Ca.

Trogress is our most important product

GENERAL



ELECTRIC



# Experience Cannot be Copied

More than a quarter-century ago MARVEL invented and basically patented the MARVEL High-Speed-Edge Hack Saw Blade—the UNBREAKABLE blade that increased hack sawing efficiency many-fold.

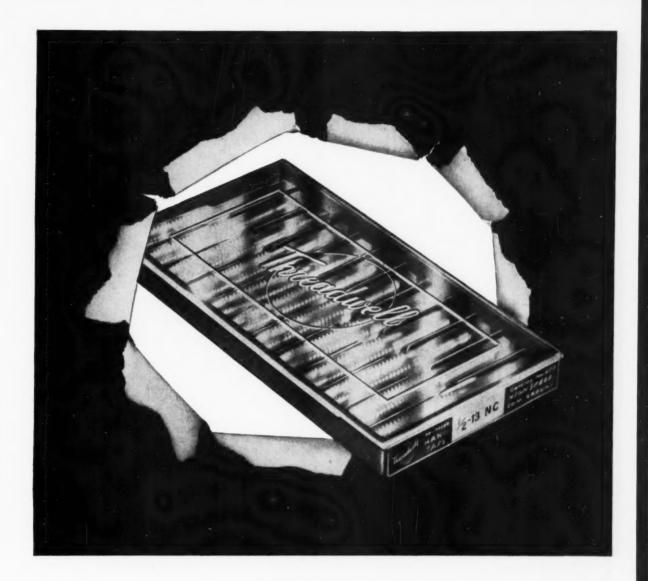
Every MARVEL Hack Saw Blade ever sold has been of that basic welded high-speed-edge construction, with constant improvements from year to year, as EXPERIENCE augmented the "know-how"...

MARVEL is not "tied" to any single source of steel supply, and has always used the best high speed steels that became available from time to time as metallurgy progressed. When-as-and-if finer steels are developed—and are proven commercially practical for welded-edge hack saw blades—MARVEL will use them, regardless of cost or source . . .

There is only one genuine MARVEL High-Speed-Edge! All other "composite" or "welded-edge" hack saw blades are merely flattering attempts to imitate — without the "know-how" of MARVEL EXPERIENCE . . .

Insist upon genuine MARVEL High-Speed-Edge when buying hack saw blades—and be SAFE, for you can depend upon MARVEL. They have been "tested", "pre-tested", and "re-tested" by thousands of users for more than a quarter-century!





# NOW Threadwell quality is protected in new plastic packages!

In April Threadwell Distributors will begin to receive Threadwell taps in striking new lifetime plastic packages.

These packages will not only protect the fine quality of Threadwell taps but will also speed up delivery both to the Distributor and the user.

Threadwell is justly proud of the high quality of its products and this new package is one more evidence of our policy to produce the best possible product at the lowest possible price. Our only business is the manufacture of fine cutting tools. We intend to stick to our last . . . first.

see your



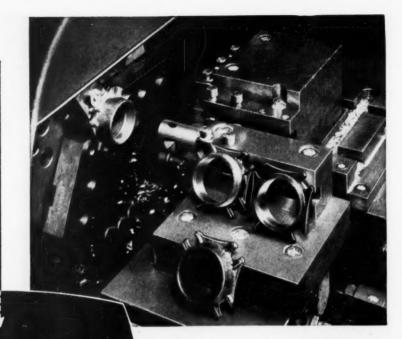
distributor

THREADWELL TAP & DIE COMPANY . GREENFIELD, MASS

For more information on products advertised, use Inquiry Card, page 261

MACHINERY, April, 1954-301

# Small Job Shop Catches the BIG IDEA



GISHOLT

No. 12 HYDRAULIC

AUTOMATIC LATHE

GESTOIT!

No matter whether the shop is large or small...if there's volume, there's the opportunity to make money faster with automatic machining.

automatic machining.

The Kilbourn Engineering Company of Milwaukee saw it—and proved it again—subcontracting these parts for electric hot water heaters with the Gisholt No. 12 Hydraulic.

#### **Greater Production**

With its fast automatic cycle and multiple cutting, the Gisholt turns out these parts at twice the rate of the previous method. A man merely loads and unloads the machine. The owner is not limited to this one job either. It is easily set up to handle a variety of work up to 12" in diameter.

### **Corner for Profit**

Such work can be highly profitable for job shops. Especially when the whole operation can be tucked into one small corner of the shop as this one is.

Progressive thinking like this is what makes many small shops grow into big ones. Gisholt engineers can help you with all kinds of ideas for making the most of machine tools.

### GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

THE GISHOLT ROUND TABLE

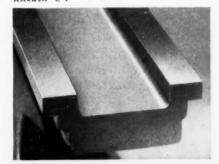
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts, Your problems are

TURRET LATHES . AUTOMATIC LATHES . SUPERFINISHERS . BALANCERS . SPECIAL MACHINES





Below: Block type ways are straddle keyed to the bed and ground in perfect alignment with the spindle. All working surfaces are hardened to 64-66 Rockwell "C".



# ACCURACY THAT DOESN'T "WEAR OFF"

Here are two good reasons why you can count on the accuracy of Gisholt Turret Lathes—now and years from now.

One-piece bed and headstock, cast as a heavy, rigid unit, reduce distortion and vibration to a minimum. Headstock is jig-bored to insure—and maintain—perfect alignment of spindle and drive shafts, with ample metal to provide the most solid

support possible.

Hardened steel ways are augmented by hardened steel strips secured to the ram saddle, as well as hardened steel gibs and clamps, making an assembly that is virtually wear-proof. Its accuracy is further preserved by force lubrication.

These advantages are yours for the long life of any Gisholt Turret Lathe. Ask for complete details.



Madison 10, Wisconsin

TURRET LATHES . AUTOMATIC LATHES . SUPERFINISHERS . BALANCERS . SPECIAL MACHINES

# Stop wasting the strength of your business on 15 to 20-year-old machine tools



# Modernize to meet your 1954 needs with Engineered Rebuilts

Factory Magazine reports that 6 out of 10 manufacturers are making the costly error of struggling along with machine tools built in 1934 and 1939—machine tools whose speed and capacity have long since sagged past creakpoint in the face of today's skyrocketing labor and overhead costs. Factory's recent survey shows:

### Question: "Approximately how frequently do you replace machine tools?"

Answer:	% of respondents				
Frequency of replacement	who reported replacing tools in period				
5 years	2.1%				
10 years	20.8				
15 years	32.9				
20 years	27.6				
25 years or more	17.2				

### Here's the economic answer

Simmons can rebuild and modernize your out-dated, low efficiency machines to make them exceed their peak capacity when brand new—and at a fraction of the cost of new machine tools! Furthermore, you can write off these rebuilding and modernizing costs far easier and quicker than you can the cost of new tools. In many cases, rebuilding can properly be charged to maintenance, thus allowing tax deduction in the current year.

Here's why leading manufacturing firms in all types of industry are asking Simmons to rebuild their machine tools. They have had long experience with the reliability of Simmons' Engineered Rebuilding techniques and know that Engineered Rebuilding is the economic answer to today's high cost of capital equipment.

#### The logical way to approach rebuilding

Make a comprehensive study of your machine tools and their production records. List those which are not performing up to par. Send this list to Simmons. We will reply promptly with quotations made on a fixed price or hourly basis—whichever proves best for you. We will be glad to send an engineer to your plant to make an on-the-spot study of the tools which require rebuilding.

**Remember**—all machine tools rebuilt by Simmons are unconditionally guaranteed. Delivery in a matter of weeks. Write or wire today.

SIMMONS MACHINE TOOL CORPORATION 1600 North Broadway, Albany 1, N. Y.

New York Office: 50 E. 42nd St



For more information on products advertised, use Inquiry Card, page 261

# This is the difference High Velocity Turning makes



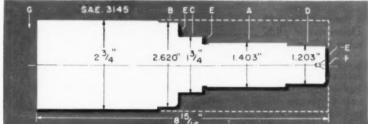
this job took...

12.40 min.

FLOOR TO FLOOR

- A. Turn 489 RPM .011 feed
- B. Turn 340 RPM .022 feed
- C. Turn 489 RPM .011 feed
- D. Turn 489 RPM .011 feed
- E. Face end, shoulders & neck 489 RPM

   .0055 feed
  Chamfer
- F. Center drill
- G. Cut off 82 RPM .0035 feed H.S.S.





this same job takes.

5.40 min.

FLOOR TO FLOOR

- A. Turn 694 PPM .022 food
- B. Turn 694 RPM .022 food
- C. Turn 694 RPM .022 feed
- D. Turn 694 RPM .022 feed
- E. Face end, shoulders and neck 694 RPM — .055 feed Chamfer
- F. Center drill
- G. Cut off 489 RPM .0025 feed

### J&L TURRET LATHES GIVE ...

**MORE Ease of Operation** 

MORE Power Transmission

**MORE Rigidity** 

**MORE Accurate Stops** 

**MORE Efficient Lubrication** 

**MORE Coolant on Cutting Tools** 

**MORE Accurate Results** 

Visitors who attend J&L's periodic "Production Studies" Seminars see this job turned out in just 5.40 min. on a Jones & Lamson #7A Universal Turret Lathe.

Only with lathes like this, built with plenty of power and the beef to back it up, can your shop take full advantage of the quality, productivity and lower costs offered by High Velocity Turning.



This job is one of the many turned at high speeds on our production line. Come to Springfield and see for yourself. At any rate, send for catalogs #101-A and #102.



JONES & LAMSON

JONES & LAMSON MACHINE CO., 512 Clinton St., Dept. 710, Springfield, Vt., U.S.A.

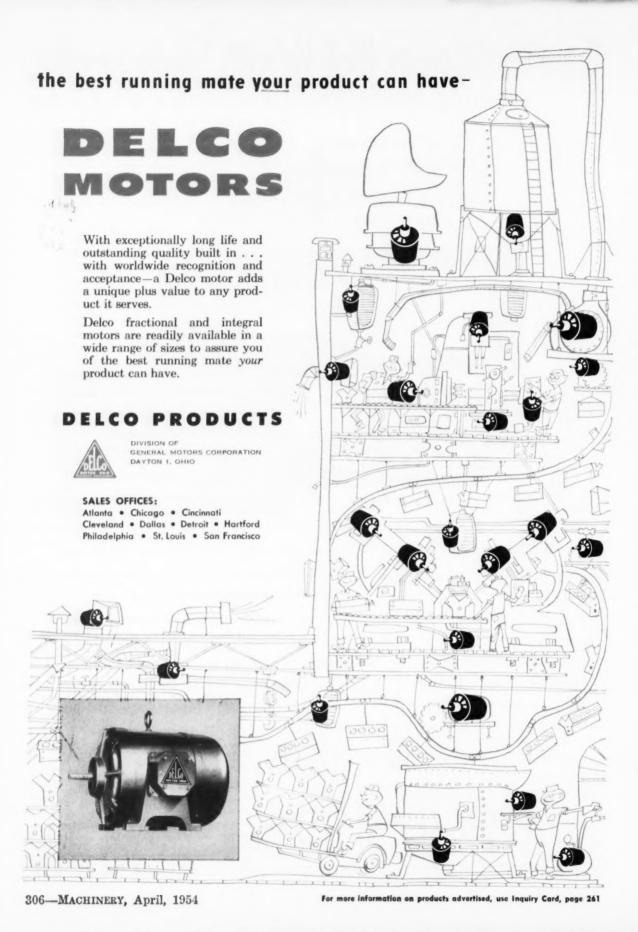


Machine Tool Craftsmen Since 1835

MACHINE TOOL DIV.

For more information on products advertised, use Inquiry Card, page 261

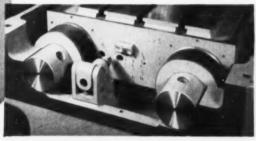
MACHINERY, April, 1954-305



THE BRYANT 6" STROKE BORING MACHINE



# uniform accurate production



### Specifications

Total table stroke					$6^n$
Top of table to top of bridge .			0		4"
Width of bridge					
Multiple boring heads as require	ed	by	tooli	ng	to a
maximum of (4) 209 heads					
Table dimensions			71/2"		
Floor space (without coolant tan	k)		31"	X	54"



BRYANT CHUCKING GRINDER CO.
SPRINGFIELD, VT.
Gentlemen: Please send me your Bulletin 998. M
Name.
Title.
Company.
Street.
City. Zone. State.

The Bryant 998 Boring Machine is a production machine for precision boring, drilling, turning, facing, grooving and contour turning and boring where fine finish and rapid production are desired.

Constant repetitive accuracy is designed into the Bryant 998. The table is mechanically actuated by a simple cam and lever unit. The cycle is positive...free from variation due to temperature change.

The table moves on two 4" dia. hardened and ground solid steel bars firmly bolted to the bed. Each slide bar has two widely separated bearings—hardened steel sleeves surrounding retainers in which 150 balls of 3%" diameter are mounted under preload.

This rugged slide construction provides metal-to-metal contact, resists loads from any direction, provides sensitive response and uniform travel.

The Bryant 998 will withstand heavy use and will continue to produce parts within tolerance at the specified production rate.

# ■RRYANT

Chucking Grinder Co.

SPRINGFIELD, VERMONT, U. S. A.

Internal Grinders • Boring Machines
Internal & External Thread Gages • Granite Surface Plates

# How GREENLEE uses

# Powerful Scully-Jones "Roll-Lock" tools permit faster, more accurate chucking!

This Greenlee Transfer Unit is equipped with 16 Scully-Jones "Roll-Lock" Tool Chucks, which provide a completely different, advanced method for holding and driving reamers.

Taking advantage of the elastic properties of metal, "Roll-Lock" Chucks compress evenly and powerfully on the shank of the tool... provide an accurate, centering shrink-fit free of all clearance or play. Actuation and release are fast and easy. Operator merely twists the actuating ring (only rolling friction has to be overcome) to produce the powerful "Roll-Lock" wedging action on the tapered chuck body. There are no accessory tools or time-wasting operations. Positive, rigid holding permits use of heavier feeds and speeds.

Accurate chucking . . . often within .0001"T.I.R. . . . improves finish and accuracy, prolongs tool life by eliminating vibration and runout. Standard or special "Roll-Lock" Arbors, Mandrels, and Chucks, for internal or external chucking of parts or tools, will increase profits on a wide variety of your production machining and inspection operations. Call your nearby Scully-Jones representative or distributor—factory-trained "Precision Tool and Work Holding Specialist"—for complete information and service.



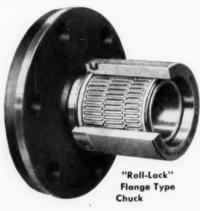
Reduce loading, unloading or setup time—Simple, quick method of chucking to a shrink fit eliminates tapered mandrels, hammering, lead plates, and arbor presses.

Speed turning and grinding operations—Rigid, powerful holding action permits transmission of torque and thrust required for heavy feeds and high speeds.

Improve work finish and reduce rejects—Provide chucking accuracy difficult to obtain by any other method.

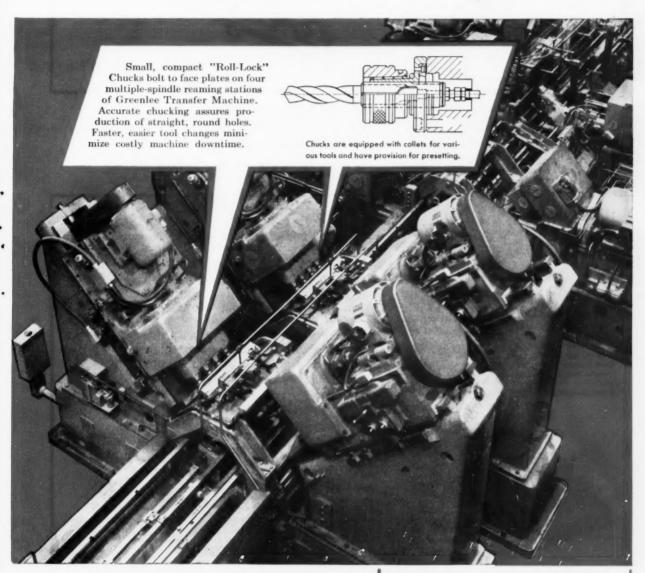
Simplify and speed operation—Workpieces always easy to load in same position due to simple, accurate method of locating and chucking.

Testing for runout made easy—Equal force evenly applied around chucking surface, accurately centering the piece being tested.





# newest chuck development





Precision Holding

Scully-Jones and Company, 1906 South Rockwell Street, Chicago 8, Illinois

For more information on products advertised, use Inquiry Card, page 261

### **BULLETIN!**

52 pages of profit-boosting ideas and methods for chucking parts and tools.



Gentlemen: I'm interested in learning more about Scully-Jones "Roll-Lock" Tools . . .

- Please send Bulletin No. 17-50
- Have representative call

Name

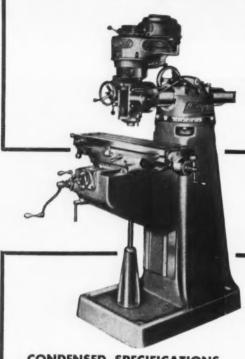
Compan

Address

City...

State\_\_\_

MACHINERY, April, 1954-309



# The Bridgebort TURRET MILLING MACHINE

### 5 REASONS FOR THIS MACHINE'S REMARKABLE ACCEPTANCE RECORD

### because:

- 1...it mills, drills, bores and shapes without changing set up; milling head can be positioned at all angles over wide area.
- 2...it handles a wide variety of work more accurately and more economically and is applicable to tool room, die shop and production.
- 3...it provides productivity over a maximum number of machine hours and is versatile with all-round handling convenience.
- 4...attachments available provide outstanding range of utility.
- 5...moderate price puts it within reach of all shops large or small.

### CONDENSED SPECIFICATIONS

8 Spindle Speeds . . . from 80 to 2720 RPM. Back geared Spindle Drive Unit . . . utilizes full power at all speeds without belt slippage.

Power Feed to Quill: 3 steps . . . .0015, .003 and .006 in. per spindle revolution.

Quill Travel: 5"

Spindle Brake and Lock for convenience in changing tools.

Collet Capacity: up to 3/4" diameter.

A FEW "BRIDGEPORT" ATTACHMENTS EXTENDING UTILITY



No. 2 BORING HEAD Boring Tools and Holder provide means for boring holes up to 6" diameter; available for use on Bridgeport 1HP Milling, Drilling and Boring Attachment.



RIGHT ANGLE ATTACHMENTS
(Left) Heavy Duty . . . for milling and drilling or right angles; fits both Master and 1HP Bridgeport Heads. (Right) Light Duty . . for right angle milling and drilling narrow, deep molds and cavities.



MILLING MACHINE VISE Improved and providing great gripping power with large diameter screw for rigid holding. Streamlined for appearance and equipped with coolant trough. Two sizes: 5" x 3½" and 6" x 5" jaw openings.

Ask your dealer . . . or us, to show you how you can make the "BRIDGEPORT" pay handsome returns on your investment.

Bridgeport MACHINES, INC.

Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines

# MCCROSKY

1904-1954

COST CUTTING TOOLS

50TH ANNIVERSARY

# Super Adjustable

# **REAMERS**

**Chucking and Shell Designs** 

Sizes from 15/16" to 6" in Diameter





### with CARBIDE TIPPED, Cast Alloy or High Speed Steel Blades

Standardize on McCrosky Super® Adjustable Reamers! They enable you to combine the efficiency of carbide reaming and the greater economy and longer life of inserted blade design. Our exclusive, patented, pin and screw locking device holds the blades as rigidly as a solid tool;—yet permits the blades to be released quickly; and adjusted evenly and accurately preparatory to regrinding. Consequently, only a minimum amount of the carbide is removed, saving grinding time, and minimizing

purchases of replacement blades. The body lasts almost forever.

McCrosky Reamers have demonstrated their greater efficiency and economy under all kinds of work conditions. They cut freely without "chatter" ... avoid any tendency to "dig in";— and meet every requirement of the higher operating feeds and speeds now being used in most shops.

Send for Bulletin No. R-17, and start today cutting your costs with McCrosky Super® Adjustable Cost Cutting Reamers.

### MCCROSKY

Universal

#### MILLING CUTTERS

Body can be bladed to rotate either right or left hand. Consequently, selecting blades with tips of proper mounted at proper angles produces

ing blades with tips of proper material mounted at proper angles produces a cutter that meets any metal or machine condition. Write for Bulletin No. 531 today.

### MCCROSKY

Jack - Lock

MILLING CUTTERS

Face Mills, Shank and Shell End Mills, Half Side and S Staggered Tooth Milling Cutters fitted with high speed steel, cast alloy or carbide tip

steel, cast alloy or carbide tipped blades. Sizes from 3" to 24" in diameter to meet any requirement. Write for Bulletin No. 17-M.

### MCCROSKY

Wizard

#### QUICK-CHANGE CHUCKS

McCrosky's Wizard Quick-Change Chuck and Collet outfits hold tools centered and rigid. They enable the operator to change tools easily and quickly, without stopping or slowing down the spindle. Successive operation jobs become continuous. Write for Bulletin 18-C.

### MCCROSKY

Turret

#### TOOL POSTS

These tool posts permit successive tools to be swung into cutting position quickly, indexed accurately, and locked rigidly, gi

rately, and locked rigidly, giving engine lathes many of the advantages of turnet lathes. Four styles—11 sizes. Write for Bulletin 18-T.

### McCROSKY Block Type

BORING BARS

Individually ground and hardened tapered V-key centers the block and cutting blades accurately and rigidly yet permits easy release for regrinding, and "floating" with extreme accuracy when making finishing cuts. Wide range of stock sizes, Write for Bul. 18-8.

### MCCROSKY

Multiple Operation

#### TOOLS

McCrosky "Specials" combine two or more related boring, facing, chamfering or reaming

operations into a single tool saving set-up time and cutting costs. Engineered by McCrosky to your work prints. Write for Bulletin 17-S.



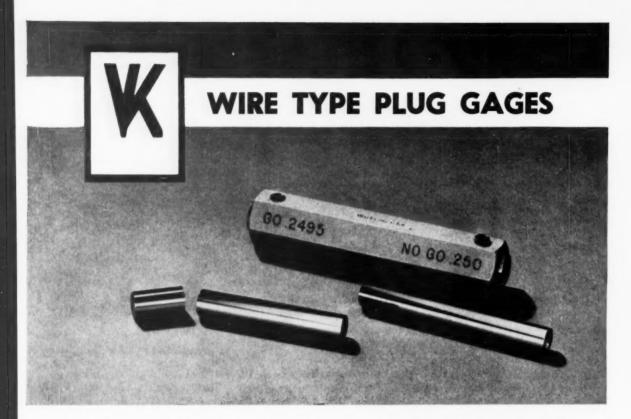
McCrosky

TOOL CORPORATION

Engineering and Sales Representatives in the Principal Cities

For more information on products advertised, use Inquiry Card, page 261

MACHINERY, April, 1954-311



### **VASTLY LONGER-LIVED and MONEY-SAVERS**

### because they're "Cut-off-Able" as well as "Reversible"

As a Van Keuren agent put it, "They're not only reversible, they're cut-off-able". And that means when you buy Van Keuren Wire Type Plug Gages, the sizes below 3/8" may be cut off when ends become worn and as many as from five to ten gages made available from the 1.7/8" and 2" long units. It is not only economical and practical to use Van Keuren Gages but it is a very simple operation to cut off the ends by following instructions furnished on request. The illustration above shows clearly the cut-off and reversible features.

VK Wire Type Gages are available in ZZ to

XX accuracies in sizes from .001" to 1.000". They are furnished in alloy tool steel, high speed steel, chromium plate or tungsten carbide. Whatever the gaging job, the extra length provided in VK units will save you money. It will also pay you to take advantage of VK deliveries. In many cases we can ship your requirements from stock.

VK Wire Type Plug Gages are fully described in Catalog and Handbook No. 35, available on request by writing to: The Van Keuren Co., 178 Waltham Street, Watertown, Mass.



# THE Van Keuren co.,

### 178 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carbolay Cemented Carbide Plug Gages • Carbolay Cemented Carbide Measuring Wires



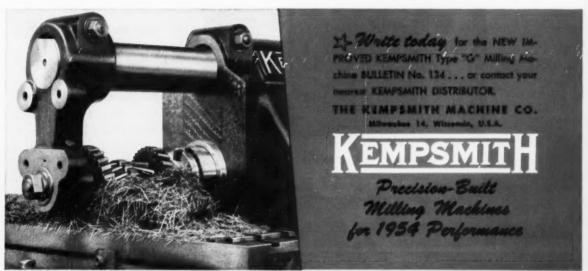
# DO YOUR MILLING MACHINES POSE SERIOUS '54 DOLLAR-QUESTIONS?

Are your milling machines OLDER THAN YOU THINK? Are they costing you more than you can afford? Recent surveys indicate many thousands of millers over 10 years old . . . and some even younger . . . have been so badly overworked that they are much older than their age implies. In terms of production efficiency, it would pay to "retire" them. Precision-wise and cost-wise, many "good looking" machines are dangerously too old to compete in today's production economy. Are your milling machines wastrels? Are they squandering dollars? Are they an "iron curtain" between you and profitable sales in today's competition? Wouldn't you consider abler replacements, as a sensible investment, to increase your ability to produce at a profit?

• You'll find sound answers to these 1954 dollar-questions in our BULLETIN\* on the new

### IMPROVED TYPE "G" KEMPSMITH MILLING MACHINES

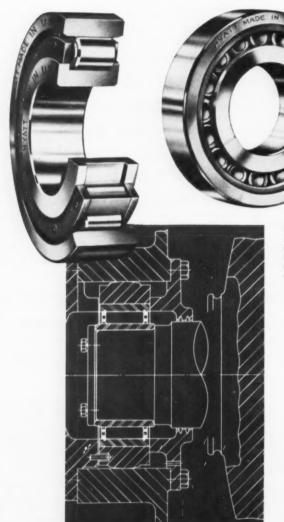
... free from cost-adding non-essentials ... fortified with practical performance advantages ... economical in first cost and maintenance ... RIGHT for toolroom, maintenance, job shop and general precision production operations.



A 7828-1PC

Is shaft expansion a problem?

# HERE'S HOW HYATTS HELP...





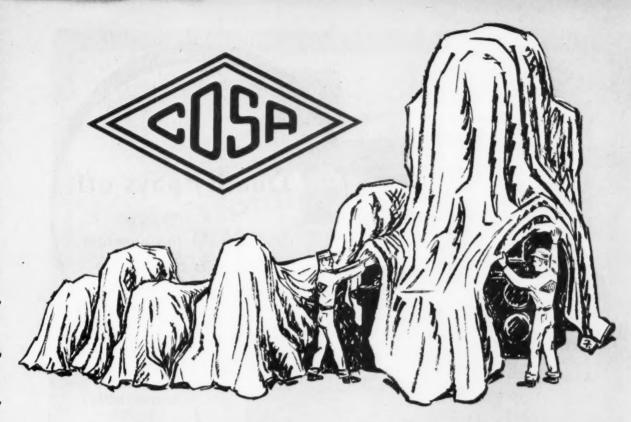
Hyatt Hy-Loads are available in separable outer race, separable inner race or non-separable construction.

Check the drawing at the left. The bearing is a Hyatt Hy-Load, and because the inner race is cylindrical, the shaft it supports is free to move axially—thus allowing for shaft expansion without cramping the bearing or distorting the shaft. Obviously, this is only one of many ways in which Hyatt bearings can be used to reduce costs as they reduce friction, but it's a good example of why so many designers throughout industry keep their Hyatt catalogs within easy reach.

For further details write for Catalog 150 or call your nearest Hyatt representative.

**ROLLER BEARINGS** 

STRAIGHT () BARREL () TAPER ()
HYATT BEARINGS DIVISION - GENERAL MOTORS CORPORATION - HARRISON, NEW JERSEY



# COSA WILL EXHIBIT 35 MACHINE TOOLS, 9 OF THEM NEW, AT THE ASTE SHOW—BOOTH 1559

We hope you get to Convention Hall, Philadelphia the week of April 26th. If you do, please visit us and see these leading Swiss and German machine tools in operation.

NEW-universal milling machine

NEW-vertical turret lathe

NEW-optical jig borer

NEW - drum-type turret lathe

NEW — multi-spindle hydro-copying milling machine

NEW — engine lathe

NEW - crankshaft balancing machine

NEW - swiss automatic with drum turret

NEW - cylindrical grinder

#### PLUS

DRILLS Radial, universal

AUTOMATIC FORMING MACHINES
Wire and strip, washer

WIRE STRAIGHTENING AND CUT-OFF MACHINE

GRINDERS Gear, profile, tool and cutter

PANTOGRAPH MACHINES Die-sinkers, 2 and 3 dimensional engravers

TOROIDAL COIL WINDER

INSPECTION EQUIPMENT

Mechanical comparator, electrical surface finish comparator, bench micrometer

COSA CORPORATION
405 Lexington Ave., New York 17



synonymous. The high standards and painstaking Swedish craftsmanship on which the SAJO reputation has been established are faithfully maintained in all SAJO Milling Machines. They are built to assure the accuracy and dependability which mean profitable operation—and their cost is surprisingly low. Available in 3 models!

Model 54 (illustrated) a full No. 2 capacity ALL-GEARED Miller—Plain or Universal types —  $7\frac{1}{2}$  HP motor (5 HP optional) —  $1\frac{1}{2}$  HP table feed motor; #50 NMT spindle; 16 spindle speeds up to 1500 RPM; single lever speed and feed selectors with direct reading dials; single lever control for START-STOP-BRAKE; table power feed and POWER RAPID TRAVERSE in 3 directions. Model 53 Light Duty No. 2 ALL-GEARED Miller. Model 48 Light Duty No. 2 Utility Miller.

\*Ask for references

austin industrial corp.

ASTE SHOW BOOTH 1334

76-E MAMARONECK AVE., WHITE PLAINS, N.Y.

Look for the Austin Seal - your full guarantee of satisfaction.

316-MACHINERY, April, 1954

For more information on products advertised, use Inquiry Card, page 261



#### Loosen a Set Screw and Look at the Shaft it's Pressing Against.

#### Has The Set Screw Made A Full Circle Impression?

To obtain the maximum resistance to rotation and sliding movement, a set screw must bear evenly on the shaft. Allenpoint Set Screws reproduce a full circle pattern against their mating surface for increased holding power. Even on shafts of small diameter you get a full circle impression with the smaller cup point of Allenpoint Set Screws.

#### Has The Point Left An Uneven Ridge Around The Indentation?

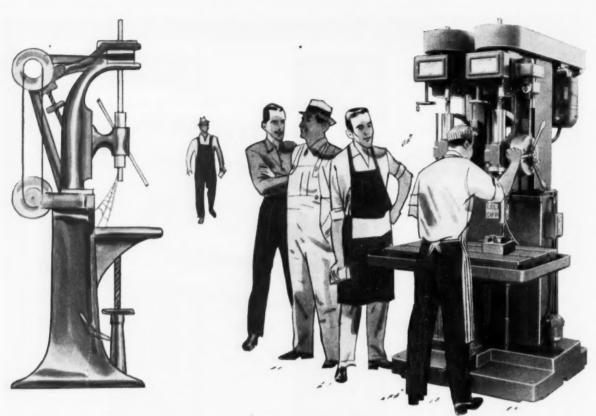
The holding power of a set screw will be greatly reduced if the bearing surface is rough and irregular. Serrated point set screws cut into the shaft, raising a chip, removing stock and weakening their grip. Allenpoint Set Screws press firmly into the shaft and form a smooth, deep indentation. The result is holding power that tops any other type point.

WHEN ORDERING THROUGH YOUR LOCAL INDUSTRIAL DISTRIBUTOR, SPECIFY ALLENPOINT SET SCREWS



MANUFACTURING COMPANY
Hartford 2, Connecticut, U.S.A.





### It's time to weed out the wallflowers

When operators stand in line to use a new Leland-Gifford Drilling Machine rather than the old belt driven model (it actually happens), it's time to check up.

You'll find plenty of good reasons for their choice. First of all, new Leland-Gifford Machines are easier to use. With convenient central controls, reduced work handling, more speed and built-in safeguards against costly errors, the average

operator can greatly increase machine production with no more effort on his part. With the added advantage of higher precision, he can do better work, too.

If drilling machines in your plant are turning into "wallflowers", it will pay you to look into the complete line of modern Leland-Gifford Motor Spindle Drilling Machines. Write for complete information or call the office nearest you.

SAVE DAYS - CONTACT THE OFFICE NEAREST YOU

# LELAND-GIFFORD

Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.

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  P. O. Roy 217
- P. O. Box 217
  NEW YORK OFFICE
  75 South Orange A

- O LOS ANGELES OFFICE
- 2620 Leonis Blvd INDIANAPOLIS 6
- P. O. Box 1051

  ROCHESTER 18
  P. O. Box 67, Roselawn Station



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Heavy Land Additional

Tips Blend

Redial Rolls
Stronger Til
Support

Polished Flutes Heavy Web

Heavier Carbide Tip Six points of superiority—

Result of two years' research. Extensive tests indicate it's the most durable and the fastest cutting carbide twist drill developed to date. Feeds as high as 8" per minute in cast iron have been obtained. Stocked in fractional, wire and letter sizes for your convenience.

**NEW LOW PRICES** 

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ITY CARBIDE TOOLS

21650 Hoover Rd., Detroit 13, Michigan

5210 San Fernando Rd., Los Angeles 3, California

For more information on products advertised, use Inquiry Card, page 261

MACHINERY, April, 1954-319

# Borg-Warner speeds staking job 36%

with a 75-ton

## MULTIPRESS

Safer operation, fewer rejects and other production gains reported at Mechanics Universal Joint Division, Rockford, Illinois

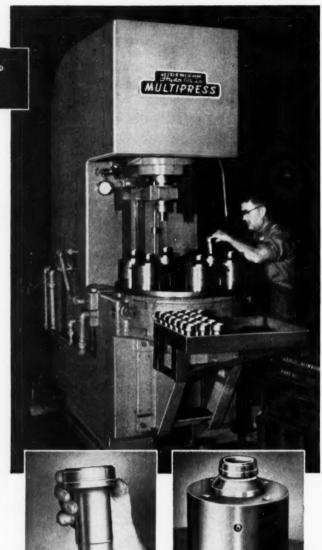
IN this operation, a flat steel disc 3/32" thick is inserted by hand in a steel sleeve used in an automotive universal joint. The disc rests on a shoulder formed where the inside diameter of the sleeve changes abruptly to a smaller dimension.

The sleeve is internally machined, leaving a small, continuous lip of metal just above the edges of the correctly seated disc. With gentle, smooth staking effort, the Multipress ram tooling forces this lip solidly against the edges of the disc. It is a precision operation, as the disc must separate the two different LD areas with a permanent oil-tight seal.

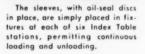
The 75-ton Multipress, equipped with a six-station Denison Index Table, is set for continuous cycling. The ram reverses automatically when preset pressure is reached.

The operator simply places the parts in the table fixtures, with the discs properly in place. The parts are then indexed automatically under the ram, and the oil seal is firmly staked in place. At the second index position past the ram, the operator removes the staked assemblies.

In addition to a 36 per cent production gain, Multipress does the job with closer uniformity. Scrap has been reduced to the vanishing point, die life increased, and labor costs cut. The same Multipress brings similar savings on 21 different operations at this plant.



In the thick-walled steel sleeve both outside and inside diameters are larger, at one end. A discshaped oil seal separates the different-sized greas.













Multipress offers a wide range of bench and floor models, in capacities from one-ton to 75 tons. Manual, footpedal, push-button and automatic controls are available, for single or sequence operations. Dual safety controls and the servo-type Multipress Touch Control are also available. Six-station and 12-station Indexing Tables and many other standard Multipress attachments provide many additional production-speeding advantages. Write for the illustrated story, "MULTIPRESS — and how YOU can use it"... there's no obligation.

THE DENISON ENGINEERING COMPANY, 1152 Dublin Rd., COLUMBUS 16, OHIO

Bodine CASE HISTORY NO. 37



2 /2

S haper by pury and proper

the fillings is something, pullinguistics

5
Spot face %" dia.
maintaining depth
to ± .002".

Automatically hopper feed, transfer and insert Oilite bushing.

PROCESSING WINDSHIELD WIPER MOTOR HOUSINGS

7 Drill 4-#31 dia. (.120") holes and 1-.1235" dia. hole (angularly mounted multiple drill head).

#### **PRODUCTION**

One piece per stroke . . . 20 strokes per min.

— 1000 pieces per 50-min. hour. 10,000 individual operations per 50-min. hour.

Tap 2 holes #10-32 with angularly mounted 2-spindle tap head.

#### MATERIAL

S.A.E. #925 Die Casting (Parts No. EMG-2, EMG-3, right- and left-hand). Sixe I.D. of Oilite bushing to .3735" - .3745" dia.

#### TOLERANCES

(Other than specified above) Drilled holes: Size .001". Location: ± .002". Tapped holes: Class 2 threads.

#### MACHINE

Bodine Model 42-30 Drilling, Tapping, Assembling Machine. Write us for Bodine Brochure M-4 "12 Case Histories."

"You Can't Meet Tomorrow's Competition
With Yesterday's Machine Tools."

11 -----

Bodine

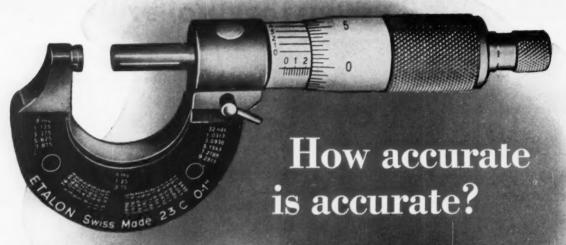
CORPORATION CONNECTION

AUTOMATIC DIAL TYPE DEILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

18064

For more information on products advertised, use Inquiry Card, page 261

MACHINERY, April, 1954-321



#### **ETALON 23C**

is the only micrometer having a thimble graduated in both .001 and .0005 of an inch. These micrometers feature extra heavy duty TUNGSTEN CARBIDE measuring faces, a quick acting lock, and a one piece STAINLESS STEEL screw.



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Accuracy means different things to different people.

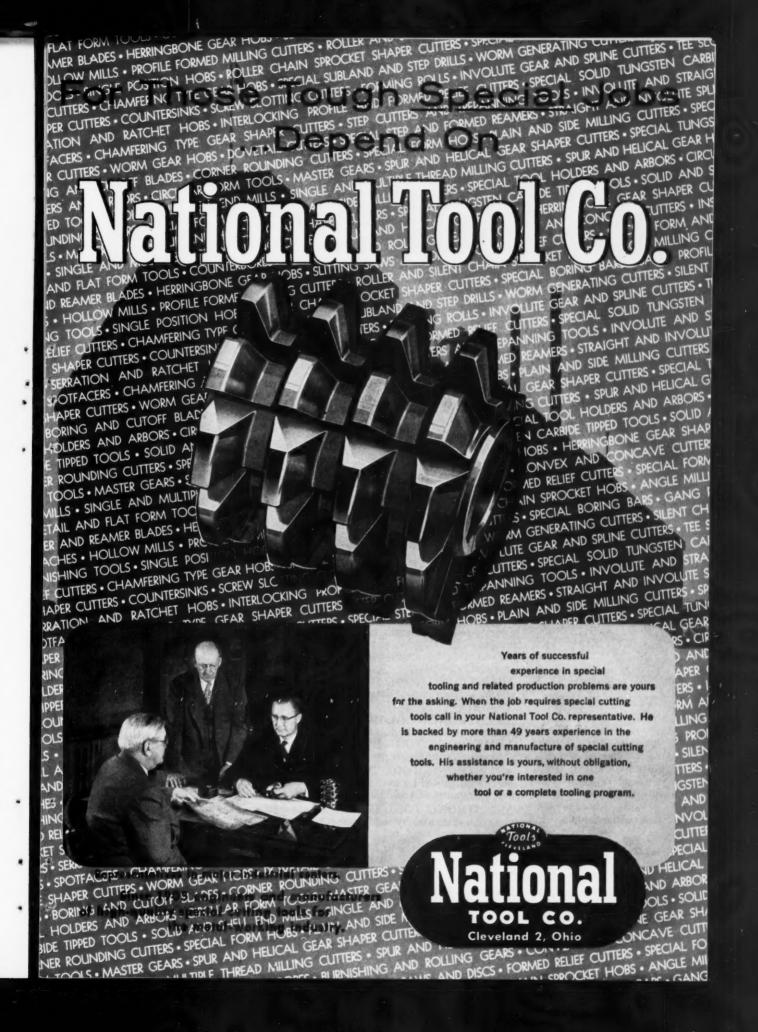
One shop may let minor variations in machining accuracy "pass" for the sake of speed . . . but he runs the risk of rejects. Another will not permit any lowering of standards . . . but he knows the extra effort is worthwhile.

If you want utmost speed and accuracy in your operations...if your products must be able to stand the most careful inspection...if you demand consistent precision and quality at moderate prices, then specify ETALON.

Manufactured of special Stainless Steel, hardened and normalized, ETALON micrometers, calipers, height gauges, and various other precision measuring instruments are bringing America's top manufacturing plants a standard of unfailing accuracy that insures faithful customers.



401 Broadway, New York 13, N. Y.
In Canada: Swiss Instruments Co. Reg'd., Granby, Quebec



# ARMSTRONG





The ARMSTRONG Threading Tool takes interchangeable high speed steel form-cutters which require only flat top grinding to resharpen—always hold their true thread form.

See us at Booth 232, ASTE Show, Philadelphia Every rise in labor costs, every added tax, every overhead burden, every increase in cutting steel prices, every new, more costly machine tool, all increase the importance of ARMSTRONG TOOL HOLDERS to profitable operation.

ARMSTRONG TOOL HOLDERS reduce direct tooling costs to an absolute minimum—"Save: All Forging, 70% Grinding, 90% High Speed Steel."

ARMSTRONG TOOL HOLDERS reduce tooling-up time to minutes, to the selection and adjustment of the holder and cutter.

ARMSTRONG TOOL HOLDERS permit increased speeds and feeds — produce more pieces per hour per machine tool.

ARMSTRONG TOOL HOLDERS are efficient for they embody a perfection gained by over 50 years of specialization in the development and refinement of tool holders.

ARMSTRONG TOOL HOLDERS are inexpensive because they are

quantity produced by modern methods, for a world market... are used by over 96% of the machine shops and tool rooms... are carried in stock for your convenience by all industrial distributors of consequence.

Write For Catalog

Buy
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TOOLS from your
Industrial Distributor

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"
5213 W. ARMSTRONG AVENUE CHICAGO 30, ILL

THE
LITTLE
GIANT
OF
THE
PETERMANN
FAMILY



For work within its capacity (pieces  $\frac{y_2 \pi^{\prime\prime}}{1}$  in diameter and  $\frac{1}{2}\frac{y_1 \pi^{\prime\prime}}{1}$  long) we offer a machine of deadly' accuracy and high production . . . 10 speeds to 12,000 RPM.



The P-4 AUTOMATIC

On this page we can show only one of the P-4's salient advantages...the ability to remove a tool for sharpening without removing it from the tool holder ... and grinding in place.

The many other advantages are described in Catalog sent on request.

BUSSELL, HOLBROOK & HENDERSON, INC.

292 Madison Avenue, New York 17, N. Y.

# Product Directory

To find headings easily, look for capital letters at top of each page to denote locations.

#### ABRASIVE CLOTH, Paper and Belt

Cerborundum Co., Buffalo Ave., Niagara Falls, Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

See Discs, Abrasive

#### ABRASIVES, HONING

Barnes Drill Co., 814 Chestnut St., Rockford,

#### ABRASIVES, Polishing, Tumbling, Etc.

Carborundum Co., Buffalo Ave., Niagara Falls, Norton Co., 1 New Bond St., Worcester 6,

Mass. Simonds Abrasive Co., Tocony and Fraley Sts., Bridesburg, Philadelphia, Pa.

#### ACCUMULATORS, Hydraulic

American Steel Foundries, Elmes Engineering Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.

Baldwin-Lima-Hamilton Corp., Philadelphia,

Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Farquhar, A. B., Div. Oliver Corp., 21 Duke St.,
York, Pa.
Farrel-Birmingham Co., Inc., 25 Main St.,
Ansonia, Conn.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo,
N. Y.

N. Y. Morgan Engineering Co., Alliance, Ohio Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich. Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

AIR HOISTS-See Hoists, Air.

AIR TOOLS—See Grinders, Pneumatic; Drills, Portable Pneumatic, Etc.

#### ALLOY STEELS

ALLOY STEELS
Allegheny Ludium Steel Corp., Pittsburgh, Pa. Bethlehem Steel Co., Bethlehem, Pa. Carpenter Steel Co., Reading, Pa. Columbia Tool Steel Co., Lincoln Hwy. & State St., Chicago Heights, Ill.
Crucible Steel Co. of America, Chrysler Bldg., New York 1, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., Carnegie-Illinois Steel Corp. Div., 436 7th Ave., Pittsburgh, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

#### **ALLOY STEELS, High Temperature**

Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

#### ALLOYS, Non-Ferrous

American Brass Co., 25 Broadway, New York. Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y., Mueller Brass Co., Port Huron 35, Mich. Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

#### ALLOYS, Zinc

New Jersey Zinc Co., 160 Front St., New York, N. Y.

#### ARBOR PRESSES

See Presses, Arbor

#### ARBORS AND MANDRELS

Amco Gage Co., 19760 W. 8 Mile Rd., Detroit 19, Mich. Beaver Tool & Engineering Corp. (Arbors, only), 2850 Rochester Rd., Box 429, Royal Oak, Mich. Brown & Sharpe Mfg. Co., Providence, R. J. Chicago-Latrobe Twist Drill Works, 411 W.

Brown & Sharpe Mfg. Co., Providence, R. I. Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, III. Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, III.
Erickson Tool Co., 2309 Hamilton, Cleveland, Ohio
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Gorton, George Mch. Co., 1110 W. 13th St., Racine, Wis.
Jacobs Mfg. Co., West Hartford, Conn. Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Keo Cutters, 19326 Woodward, Detroit, Mich. National Tool Co., 11200 Madison Ave., Cleveland, Ohio.

land, Ohio. National Twist Drill & Tool Co., Rochester,

Mich. (Continued on page 328)

Milling

and Centering Simultaneously and in Continuous Production

> FREE DATA

Here's an excellent example of how two entirely different operations can be combined on one machine. This Davis and Thompson continuous type Roto-Matic both mills and centers on both ends in one operation. Rough and finish milling cuts on the ends of the shaft and centering of both ends is completed with only one rotation of the fixture drum. The centering heads travel with the work station until centering operation is complete then drop back to next work station and repeat. Automatic equalizing clamping is provided to the fixture. Spindles have micrometric adjustment and spindle carriers are adjustable on the ways to accommodate shafts of various lengths.

on this and other Davis and Thompson machines is available in our bulletin No. 1000.



Davis and Thompson Co.

MILWAUREE IS, WISCONSIN





SPURS • SPIRALS • HELICALS • BEVELS • INTERNALS
WORM GEARING • RACKS • THREAD GRINDING

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARING

#### You Command Only The Finest Quality When G.S. Makes Your Gears

Buyers of Fractional Horsepower Gearing, in production runs, simply bave to be "tough". There can be no compromise with quality! Only Gearing of greatest uniform accuracy is good enough.

Quality minded manufacturers from coast-tocoast make us responsible for all the Small Gearing they use. You, too, can profit by coming to "Small Gear Headquarters". Take advantage of the wealth of creative engineering skill we can apply to your power transmission problems.. know-how gained in 35 years of specializing in making Small Gearing, exclusively. Ample production capacity assures deliveries in time to keep assembly lines rolling. Will you tell us about your needs today?

SEND FOR free 6-page folder. See where and how we mass-manufacture Small Gearing to uniformly fine tolerances. Folder contains 23 pictures of Small Gears, plant views, as well as Diametral and Circular Pitch Tables. Ask for your copy on company stationery, please!



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and Cleveland . Chicago . Detroit Hillside, N. J. . Bullalo . Cincinnati Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Supreme Products, Inc., 2222 So. Columet,
Chicago 16, Ill.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.
Western Tool & Mfg. Co., 1640 E. Wheeler St.,
Springfield, Ohio.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

#### BABBITT

Bunting Brass & Bronze Co., Spencer and Carl-ton Aves., Toledo, Ohio. Johnson Bronze Co., New Castle, Pa. Ryerson, Jos. T., & Son, 2558 W. 16th St., Chicago 18, III.

#### BALANCING EQUIPMENT .

BALANCING EQUIPMENT •
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Cosa Corp., 405 Lexington Ave., New York 17.
Gisholt Machine Co. (Static and Dynamic), 1245 E. Washington Ave., Madison 10, Wis.
Keller Tool Co., Grand Haven, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Orbon, Kurt, Co., Inc., 205 East 42nd St., New York 17, N., Y.
Pope Machinery Corp., Haverhill, Mass.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Defroit 7, Mich.
Sundstrand Mich. Tool Co., 2531 11th St., Rockford, Ill.
Thor Power Tool Co., Aurora, Ill.

Kennametal, Inc., Latrobe, Pa.

#### BARS, Phosphor Bronze

Bunting Brass & Bronze Co., Spencer and Carl-ton Aves., Toledo, Ohio. Johnson Bronze Co., New Castle, Pa.

#### BARS, Steel

BARS, Steel

Allegheny Ludium Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Columbia Tool Steel Co., Lincoln Hwy. & State
St., Chicago Heights, Ill.
Crucible Steel Co. of America, Chrysler Bidg.,
New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Jones & Laughlin Steel Corp., Gateway Center
No. 3 Bidg., Pittsburgh, Pa.
LaSalle Steel Corp., Union Drawn
(Cold Drawn), Republic Bidg., Cleveland,
Ohio.
Nyerson, Joseph T., & Son, Inc., 2558 W. 16th Ohio.

Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, III.

Summerill Tubing Co., Div. Columbia Sttel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.

Timken Roller Bearing Co., Canton, Ohio.

U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

Wycelock, Lovejoy & Co., Inc., Cambridge, Mass.

#### BASES, Machinery Welded

Mahon, R. C., Co., 6565 E. 8 Mile Rd., Detroit 34, Mich. Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.

#### **BEARINGS**, Babbitt

Bunting Brass & Bronze Co., Spencer and Carl-ton Ave., Toledo, Ohio. Johnson Bronze Co., New Castle, Pa. Link-Belt Co., 2410 W. 18th St., Chicago 8, III.

#### BEARINGS, Ball

Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North
Quincy, Mass.
Fafnir Bearing Co., New Britain, Conn.
Kaydon Engineering Corp., McCracken St.,
Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indian-Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indiangpolis 6, Ind.
Marlin-Rockwell Corp., 402 Chandler Bldg.,
Jamestown, N. Y.
New Departure Div., General Motors, Bristol,
Conn.
Nice Bell Beggins Co. Nicetown Philadelphia Nice Ball Bearing Co., Nicetown, Philadelphia, Norma-Hoffman Bearings Corp., Stamford, Torrington Co., Torrington, Conn (Continued on page 330)

WHAT DOES FIRTH STERLING OFFER YOU?

(ANSWER NUMBER 3)

# UNBIASED RECOMMENDATIONS

Producing tools and tool materials for the cutting, shaping and forming of metals is major business at Firth Sterling. Hence, capacity to serve you best necessarily embraces "full line tooling"... high speed tool steels and tungsten carbides, or both as needed.

So, you can count on *unbiased* tooling recommendations when you make Firth Sterling your *one* source of supply for *complete* shop tooling needs. We have no axes to grind!

What are the advantages to you?

- 1. An integrated tooling program that saves you money by matching tools to applications, without temptation to apply more expensive tools than may be necessary.
- 2. Improved production from wider selections. A choice of 97 different grades of high speed steels and tool and die steels and a dozen grades of carbides in everything from die nibs to an almost unlimited selection of standard and special carbide tools and tips.
- 3. The purchasing economies inherent to buying from one source of supply instead of from several.
- The finest "packaged" tool line today for easy handling, stocking, identification in the tool crib, and inventory control.
- 5. The consistently high quality assured by 64 years of leadership in development of special purpose steels and 24 years of pioneering in carbide and powder metallurgy applications.

Makes sense, doesn't it? Call a Firth Sterling representative.

Firth Sterling Stands for Metallurgical Achievement—Past, Present, Future
Visit Booth 120—A.S.T.E. Show

# Firth Sterling

GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

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For more information on products advertised, use Inquiry Card, page 261

# hangs up... ANOTHER COLD HEADING RECORD IN COMPARATIVE TESTS!

A nationally known fastener manufacturer\* recently made comparative tests of so!id steel cold heading dies, under carefully controlled conditions, producing %" square head machine bolts from 1020 steel on a Waterbury Farrel double stroke automatic.

Firth Sterling C.H.Q. came off with top honors and the highest production ever



C. H. Q. solid die after 192,000 run.

obtained by this manufacturer from any steel die . . . 192,045 both ends. (78,860 one end, 59 Rockwell C; 113,185 other end, 61 Rockwell C). Standard competitive carbon steel dies produced only 50,000—60,000 both ends and ultimately failed by cracking axially. The C.H.Q. die wore ove, size but longitudinally etched



Longitudinally etched section reveals no cracks.

section revealed not even a hair line crack.

Ask for technical literature on C.H.Q. or a Firth Sterling representative will discuss your die problems. His recommendations are unbiased . . . we make and sell both steel and carbide for every tooling need.

\*(name on request)

#### PRODUCTS OF FIRTH STERLING METALLURGY

High Speed Steels
Tool & Die Steels
Stainless Specialties
High Temperature Alloys



Sintered Tungsten Carbides
Firth Heavy Metal
Chromium Carbides
High Temperature Cermets



This recent Goss & DeLeeuw development has already received universal acclaim as an outstanding development.

In speed, ease of tooling and precision finishing, the "1-2-3" chucker provides engineering advantages

which result in vastly greater production at a fraction of parts' costs by other methods.

Easy, fast change-over from job to job makes this machine ideal for short-run requirements. Sturdy construction, power and speed make its advantages apparent on long runs.

"1-2-3" means ability to handle work requiring machining operations on one, two or three ends simultaneously or in sequence—a method exclusive with Goss & DeLeeuw and offered on this ma-





DELEEUW

Illustrated literature available promptly on request. Send samples of your work for time and cost estimates.

GOSS and DELEEUW MACHINE COMPANY, KENSINGTON, CONN., U.S.A

#### **BEARINGS**, Bronze and Special Allay

Bunting Brass & Bronze Co., Spencer and Carton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Johnson Bronze Co., New Castle, Pa.
Link-Belt Co., 2410 W. 18th St., Chicago 8,

#### BEARINGS, Lineshaft

Fafnir Bearing Co., New Britain, Conn. Link-Belt Co., 519 N. Holmes Ave., Indian-apolis 6, Ind. Orange Roller Bearing Co., Inc., Orange, N. J. Standard Pressed Steel Co., Jenkintown, Pa.

#### BEARINGS, Needle

Kaydon Engineering Corp., McCracken St., Muskegon, Mich. Orange Roller Bearing Co., Inc., Orange, N. J. Torrington Co., Torrington, Conn.

#### **BEARINGS**, Roller

BEARINGS, Roller
Ball & Roller Bearing Co., Danbury, Conn.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., Harrison, N. J.
Kaydon Engineering Corp., McCracken St.,
Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Marlin-Rockwell Corp., 402 Chandler Bldg.,
Jamestown, N. Y.
Norma-Hoffman Bearings Corp., Stamford,
Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearings Co., Inc., 541 Seymour St.,
Syracuse, N. Y.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

#### BEARINGS, Self-Lubricating (Oilless)

Bunting Brass & Bronze Co., Spencer and Carl-ton Aves., Toledo, Ohio. Johnson Bronze Co., New Castle, Pa.

#### **BEARINGS**, Tapered Roller

Kaydon Engineering Corp., McCracken St., Muskegon, Mich. Timken Roller Bearing Co., Canton, Ohio. Torrington Co., Torrington, Conn.

#### BEARINGS, Thrust

BEARINGS, Thrust
Ball & Rolles Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North
Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Fafnir Bearing Co., New Britain, Conn.
General Electric Co., Schenectady, N. Y.
Kaydon Engineering Corp., McCracken St.,
Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis &, Ind.
Marlin-Rockwell Corp., 402 Chandler Bldg.,
Jamestown, N. Y.
Nice Ball Bearing Co., Nicetown, Philadelphia,
Pa. Norma-Hoffman Bearings Corp., Stamford, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearing Co., Inc., Syracuse, N. Y.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

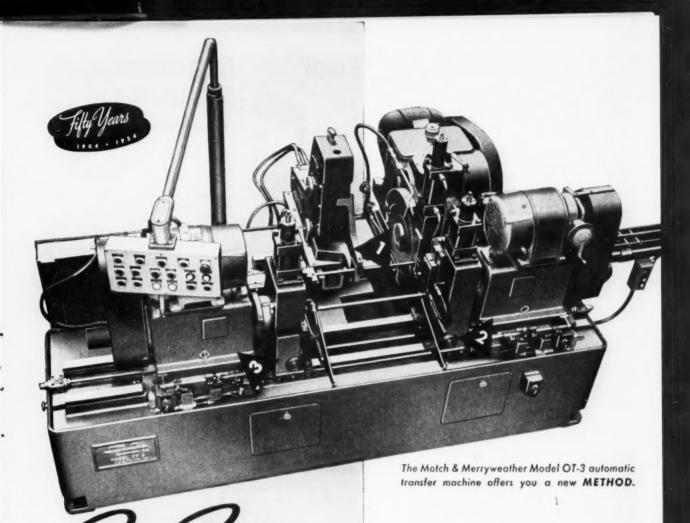
#### BELT SHIFTERS

Standard Pressed Steel Co., Jenkintown, Pa.

#### BELTING, TRANSMISSION

Houghton, E. F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa. Link-Belt Co., 220 S. Belmont Ave., Indian-apolis 6, Ind.

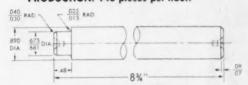
(Continued on page 332)



# - PUT 3 HEADS TO WORK



OPERATION: Cut off, chamfer inside and outside, and face. MATERIAL: SAE 1020 steel tubing. PRODUCTION: 140 pieces per hour.



OPERATION: Cut off, turn radius, chamfer and center drill one end; chamfer and center drill opposite end.

MATERIAL: SAE 1020.

PRODUCTION: 288 pieces per hour.

SIMULTANEOUSLY!

Cut off to square, accurate, milled-finish lengths and double-end machine your work continuously, and simultaneously. Bore, face, chamfer, center drill, turn, ream, or groove singly or in combination. Cut-off time is virtually free. Save labor; save tooling, time, overhead, floor space.

> THE MOTCH & MERRYWEATHER MACHINERY CO.

> > CLEVELAND 13, OHIO

Builders of Circular Sawina Fauloment, Production Millina, Turnina and Special Machines



lig boring a master fixture section for jet aircraft. Bushings were fitted to multiple holes with tolerances accurate to .0005".

Final inspection of one of four fixture sections for jet aircraft. This master fixture measures 18 feet when fully assembled.

Production jig boring projects such as thousands of these precision components.



Or this seemingly impossible assignment: To bore over 148 different size holes at different angles, holding rigid relative tolerances into precision alloy castings, completed value of which, was over \$5000 each.

Engineers are relying on B. Jahn every day to lick their real tough problems. Investigate the facilities at B. Jahn. 16 of the latest jig borers, every size, manned by master toolmakers and piloted by the best engineering brains available.

Investigate B. John and Invest in Production Economy!

SEND FOR FACILITY LIST AND LITERATURE -REQUESTS FOR QUOTATIONS WILL BE HANDLED PROMPTLY



THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

#### BENCHES, Work, and Bench Legs

Standard Pressed Steel Co., Jenkintown, Pa.

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Consolidated Mch. Tool Corp., 565 Blossom Rd., Rochester, N. Y. Hannifin Corp., 1101 S. Kilbourn Ave., Chi-cago, III.

#### BENDING MACHINES, Hydraulic

BENDING MACHINES, Hydraulic
American Steel Foundries, Elmes Engrg, Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Buffalo Forge Co., Bethiehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Farguhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.
Honnifin Corp., 1101 S. Kilbourn Ave., Chicago, III.
Hydraulic Press Mfg. Co., 30 Lincoln Ave., Mf. Gilead, Ohio.
Lake Evie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., Alliance, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Watson Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

#### BENDING MACHINES, Pipe

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y. Farguhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa. Pines Engineering Co., Inc., Aurora, III. (Hydraulic). Watson-Stillman Co., Div., H. K. Porter Co., Inc., Roselle, N. J.

#### BLAST CLEANING EQUIPMENT

Modern Ind. Enarg. Co., 14230 Birwood Ave., Detroit 4, Mich. Panaborn Corp., Hagerstown, Md. Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

#### BLOWERS

Buffalo Forge Co., 490 Broadway, Buffalo, Ingersoll-Rand Co., Phillipsburg, N. J.

#### BLUING LAYOUT

Dykem Co., 2303 P. N. 11th St., St. Louis 6, Mo.

#### BOILER TUBS

BOILER TUBS
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center
No. 3 Bldg., Pittsburgh, Pa.
Republic Steel Corp., Steel and Tubes Div.,
Republic Bldg., Cleveland 1, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th
St., Chicago 18, III.
U. S. Steel Corp., National Tube Co., Div.,
436 7th Ave., Pittsburgh, Pa.

#### BOLT AND NUT MACHINERY

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio. Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Chio.
Chio.
Chio.
Candis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
New Britain Machine Co., New Britain Gridley
Mch. Div., New Britain, Conn.

#### BOLTS AND NUTS

BOLTS AND NUTS

Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only)
Bethlehem Steel Co., Bethlehem, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Ottemiller, W. H., & Co., York, Pa.
Republic Steel Carp., Bolt & Nut Div., Republic Bldg., Cleveland 1, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., 100
Midland Ave., Port Chester, N. Y.

BOLTS, T-Slot (Continued on page 334)



For more information on products advertised, use Inquiry Card, page 261

MACHINERY, April, 1954-333



#### BOOKS, Technical

Industrial Press, 148 Lafayette St., New York 13, N. Y. Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.

#### BORING AND DRILLING MACHINES

Baker Bros., Inc., Sta. F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, III.
Barnes, W. F. & John, Co., 201 S. Water St.,
Rockford, III.

Rockford, III.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Canedy-Otto Div. Cincinnati Lathe & Tool Co.,
Oakley, Cincinnati, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.

Foote-Burt Co., 1300 St. Clair Ave., Cleveland

Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Peerless Production Corp., 19449 Giendale Ave., Detroit 23, Mich.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Wales-Strippit Corp., N. Tonawanda, N. Y.

#### BORING AND TURNING MILLS, Vertical

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio, Baird Machine Co., 1700 Stratford Ave., Strat-

ford, Conn.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cosa Corp., 405 Lexington Ave., New York 17,
N. Y.

Excell-0 Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

#### BORING BARS

BORING BARS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III.

Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.

Bullard Co., Brewster St., Bridgeport 2, Conn.

Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.

Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.

Frickson Tool Co., 2309 Hamilton, Cleveland, Ohio.

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

30, Pa.

Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.

32, Mich.

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32, Mich.
32, Mich.
Homestrand Inc., Larchmont, N. Y.
Homestrand Milling Mch. Co., 2442 Douglas St.,
Rockford, III.
Lehmann Machine Co., 3560 Chouteau Ave.,
St. Louis, Mo.,
Maxwell Co., 420 Broadway, Bedford, Ohio.
McCrosky Tool Corp., 1938 Thomas St., Mead-

Maxwer,
McCrosky Tool Corp., 1930
wille, Pa.
ville, Pa.
Peerless Production Corp., 19449 Glendale
Peerless Production Corp., 19449 Glendale Peerless Production Corp., Ave., Detroit 23, Mich. Scully-Jones & Co., 1903 Rockwell St., Chi-Ave., Detroit 23, Mich. Scully-Jones & Co., 1903 Rockwell St., Chi-cago & III. Universal Engineering Co., Frankenmuth 2,

Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

#### BORING, DRILLING AND MILLING MACHINES, Horizontal

(Floor, Planer or Table Types)

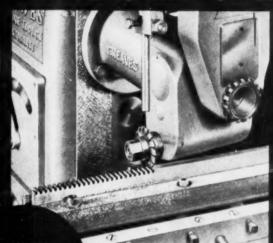
Cincinnati Gilbert Machine Tool Co., 3366
Beekman St., Cincinnati 23, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
Espen-Lucas Machine Works, Front St. and
Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 120 Oakman Blvd., Detroit
32, Mich.

Ex-Call-O Corp., 120 Oakman Blvd., Detroit 32, Mich.,
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn.
R. R., Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St.,
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Lucas Mch. Tool Div., New Britain Mch. Co.,
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Modern Ind. Engrg. Co., 14230 Birwood Ave.,
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(Continued on page 336)

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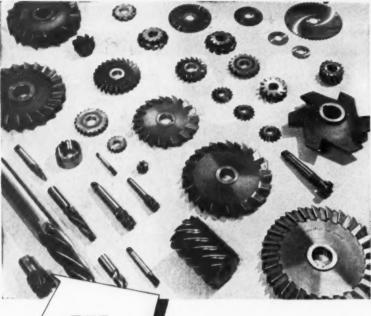


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Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Simplex Machine Tool Corp., 4528 W. Mitchell St., Milwaukee, Wis.

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American Sip Corp., 100 E. 42nd St., New York 17, N. Y. Cincinnati Bickford Tool Co., 3220 Forrer Ave. Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17,
N. Y. Cosa Corp., 405 Eexington Ave., New York 17, N. Y. Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio. Kearney & Trecker Corp., Milwaukee, Wis. Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn. Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y. Pratt & Whitney, West Hartford 1, Conn. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y. Wales-Strippit Corp., N. Tonawanda, N. Y.

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Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III.

Arrax Co., Newington, Conn.

Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.

Bullard Co., Brewster St., Bridgeport 2, Conn.

Carboloy Dept., General Electric Co., Box 237 Roosevelt Park Annex, Detroit 32, Mich.

Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

Gairing Tool Co., 21225 Hoover Rd., Detroit, Mich.

Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.

Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.

Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

Kennametal Inc., Latrobe, Pa.

Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.

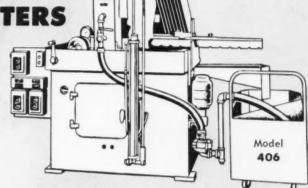
McCrosky Tool Corp., 1938 Thomas St., Mead-ville, Pa. Maxweil McCrosky T ville, Pa.
Metal Carbides Corp., Youngstown, Ohio.
(Continued on page 338)

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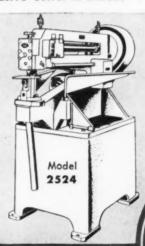
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Detroit Broach Co., 20201 Sherwood Ave., Detroit, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2 Mich.
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(Continued on page 340)

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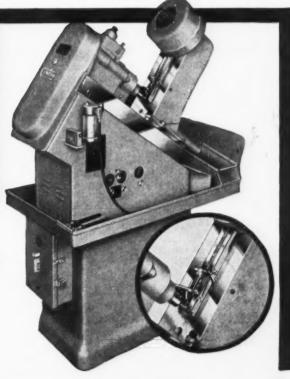
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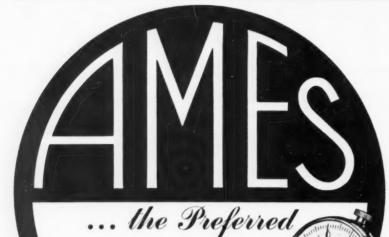
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Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
U. S. Steel Co., Inc., 436 7th Ave., Pittsburgh, Pa. Pa. S. Tool Co., Inc., 255 N. 18th St., Ampere,

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Colonial Bushings, Inc., 31780 Groesbeck Hwy., Fraser, Mich. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Universal Engrg. Co., Frankenmuth, Mich.

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Metal Carbides Corp., Youngstown, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13,
Mich. Metal Carbino Metal Community, Mich.

Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
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(Continued on page 342)

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MACHINERY, April, 1954—341

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American Brass Co., Waterbury 20, Conn. Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa. Madison-Kipp Corp., Madison, Wis.

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Bethlehem Steel Co., Bethlehem, Pa. Brown & Sharpe Mfg. Co., Providence, R. I. Chambersburg Engineering Co., Chambersburg, Pa. Pa. Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa. Link-Belt Co., 180 W. Duncannon Ave., Phila-delphia 20, Pa.

#### CASTINGS, Steel, Alloys, Etc.

CASTINGS, Steel, Alloys, Etc.

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro,
Pa.
Gorham Tool Co., 14400 Woodrow Wilson,
Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York.
Lebanon Steel Foundry, Dept. J, Lebanon, Pa.
Link-Belt Co., 180 W. Duncannon Ave., Philadelphia 20, Pa.
U. S. Steel Corp., Columbia Steel Co., Div.,
436 7th Ave., Pittsburgh, Pa.

#### CEMENT, Disc Grinding Wheel

Walls Sales Corp., 333 Nassau Ave., Brooklyn 22. N. Y

#### CENTERING MACHINES

Centering Machines

Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Machine Works, Front St., and
Glard Ave., Philadelphia, Pa.

Sc-Cell-O Corp., 1200 Oakman Blvd., Dertoit
32, Mich.
Jones & Lamson Mch. Co., Springfield, Vt.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.
Sundstrand Machine Tool Co., 2531 11th St.,
Rockford, III.

#### CENTERS, Lathe

CENTERS, Lathe
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, III.
Dakon Tool & Machine Co., 496 Broadway, Brooklyn, N. Y.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, III.
South Bend, Ind.
South Bend, Ind.
St., South Bend, Ind.
Super Tool Co., 21650 Hoaver Rd., Detroit 13, Mich.
Wesson Co., 1220 Woodward Heights, Blud. St., Sourn Science, 21650 Hoaver Ru., St., Sourn Science, 21650 Hoaver Ru., St., Super Tool Co., 2120 Woodward Heights Blvd., Ferndale, Mich. Union Twist Drill Co. Athol, Mass. Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

(Continued on page 344)



Bronze Extrusion makes a stronger, case for this industrial glass thermometer

The case for this "American" Industrial Glass Thermometer made by Manning, Maxwell & Moore, Incorporated, Stratford, Conn., used to be a steel stamping. Now it's made of ANACONDA Extruded Bronze.

Why the change? Because this extruded bronze shape makes a far stronger and more rigid case; it's easier to produce; it simplifies assemblyand adds additional quality to an already high-quality product. So accurate are these bronze extrusions that neither straightening nor machining is needed for assembly. And assembly time itself is cut.

For the base, an ANACONDA Brass Die Pressed Forging is joined to the case by brazing to provide greater joint strength. By machining the appropriate face of a single-style base forging, a stem connection can be provided at any angle.

Anaconda Brass and Bronze have long been making a stronger "ćase" for products—by simplifying production; by the higher quality that is always associated with products made of brass or bronze; by increasing sales appeal. We urge you to consider the advantages of these metals for your manufacturing processes and your products. For information, write to The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.













stem connection at any angle and direction.

Extruded case and forged base for this 9-m. "American" Thermometer are joined in perfect alignment by brazing. No machining or straightening is required.

ANACONDA —the name to remember in COPPER—BRASS—BRONZE



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Philadelphia Gear Works, Erie Ave., and G St.,
Philadelphia, Pa.

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CHUCKING MACHINES

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.

Bullard Co., Brewster St., Bridgeport 2, Conn. Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

Goss & DeLeeuw Mch. Co. (Multiple Spindle), Kensington, Conn.

Heald Machine Co., 10 New Bond St., Worcester 6, Mass.

Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.

National Acme Co. (Multiple Spindle), 170 E. 131st St., Cleveland, Ohio.

Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.

Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

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Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, III.
Schrader's Son, A., 470 Vanderbilt Avenue, Brooklyn, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Tomkins-Johnson Co., Jackson, Mich.
Whiton Machine Co., 190 Howard St., New London, Conn.
London, Conn.
London, Conn.
24000 Lakeland Blvd., Cleveland 23, Ohio.

#### CHUCKS, Collet or Split See Collets

#### CHUCKS, Diaphragm

DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Gleason Works, 1000 University Ave., Roches-ter, N. Y. Van Norman Co., 2640 Main St., Springfield 7, Van No. Mass.

#### CHUCKS, Drill

CHUCKS, Drill
Erickson Tool Co., 2309 Hamilton, Cleveland, Ohio.
Etteo Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Supreme Products, Inc., 2222 So. Columet, Chicago 16, Ill.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

#### CHUCKS, Full Floating

Erickson Tool Co., 2309 Hamilton, Cleveland, Ohio.

Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y. Gisholf Mch. Co., Madison 10, Wis.

Scully-Jones & Co., 1903 Rockwell St., Chicago 8, III.

Universal Engineering Co., Frankenmuth 2, Mich. Mich. (Continued on page 346)

# NNOUNCING THE NEW

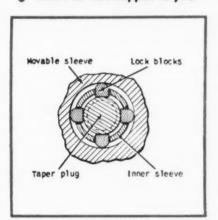
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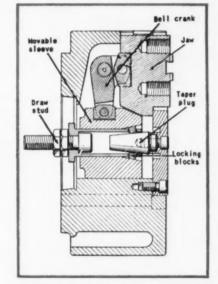
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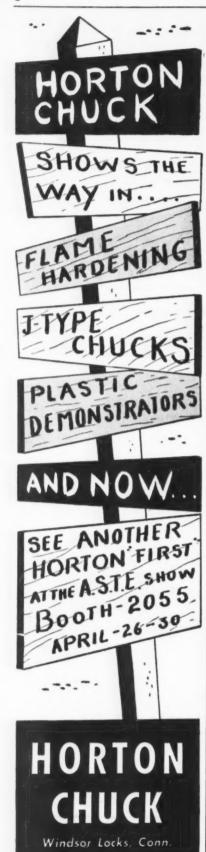
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Cushman Chuck Co., Windsor Ave., Hartford
2, Conn.
Erickson Tool Co., 2309 Hamilton, Cleveland. 2, Conn.
Frickson Tool Co., 2309 Hamilton, Cleveland,
Ohio.
Gisholt Mch. Co., Madison 10, Wis.
Harton Chuck, Windsor Locks, Conn.
Jacobs Mfg. Co., West Hartford, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Skinner Chuck Co., 344 Church St., New
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South Bend, Lathe Works, Inc., 425 E. Madison
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Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
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Gardner Mch. Co., Div. Landis Tool Co., 414 & Gardner St., Beloit, Wis.

#### CHUCKS, Tapping

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Ave., Stapleton, S. I., N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Procunier Safety Chuck Co., 18 S. Clinton St.,
Chicago, III.
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Skinner Chuck Co., 344 Church St. New cago 8, III. Skinner Chuck Co., 344 Church St., New Britain, Conn.

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Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass. Starrett, The L. S., Co., Athol, Mass. Swartz Tool Products Co., Inc., 13330 Foley Ave., Detroit, Mich. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

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Catherine St., Rockford, III.
Twin Disc Clutch Co., 1361 Racine St., Rocine,

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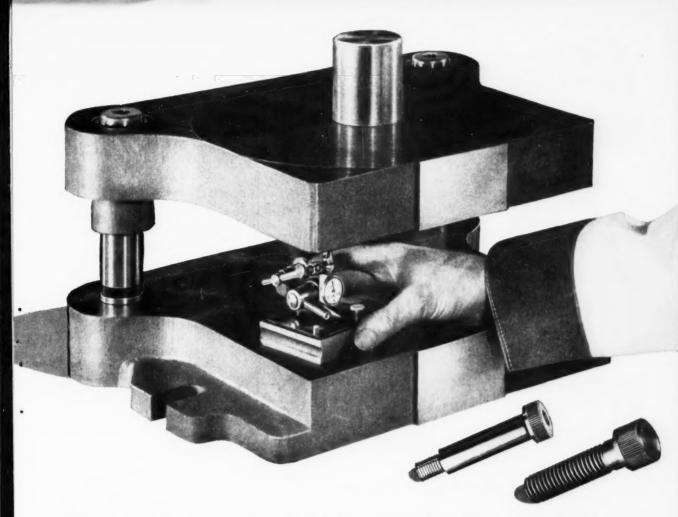
#### COMPOUNDS, Cleaning

Houghton E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa. Oakite Products, Inc., 19 Rector St., New York.

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Co., 7125 E. McNichols Rd., Detroit 12, Mich.
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(Continued on page 348)



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N. J. N. J.
Fellows Gear Shaper Co., Springfield, Vt.
Gorham Tool Co., 14400 Woodrow Wilson,
Detroit, Mich.
Hartford Special Mchry. Co., 287 Homestead
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Ohio. St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland,
Ohio.
Minster Machine Co., Minster, Ohio.
Morse Twist Drill & Mch. Co., New Bedford,
Mass.
Mummert-Dixon Co., Hanover, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Peerless Production Corp., 19449 Glendale
Ave., Detroit 23, Mich.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.
Rockford Mch. Tool Co., 250 Kishwaukee St.,
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Sheffield Corp., 721 Springfield, Dayton, Ohio.
U. S. Tool Co., Inc., 255 North 18th St.,
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DcAll Co., 254 N. Laurel Ave., Des Plaines, Ill. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pitts-burgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wison, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Tool Co., 11200 Modison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
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Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill. Allen Mfg. Co., 133 Sheldon St., Hartford 2,

(Continued on page 350)



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Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich. Union Twist Drill Co., Athol, Mass. Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich. Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

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COUNTERSINKS
Chicago-Latrobe Twist Drill Works, 411 W, Ontario St., Chicago, III.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Ex-Cell-O Corp., 120 Oakman Bivd., Detroit 32, Mich.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich. 32, Mich.
Garham Tool Co., 21223 House Wilson,
Garham Tool Co., 14400 Woodrow Wilson, 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson,
Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York.
National Twist Drill & Tool Co., Rochester,
Mich.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, III.
Super Tool Co., 21650 Hoover Rd., Detroit 13,
Mich.

Super Tool Co., 21000 1.6. Mich. Union Twist Drill Co., Athol, Mass.

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Brown & Sharpe Mfg. Co., Providence, R. I. Millers Falls Co., Greenfield, Mass. Starrett, The L. S. Co., Athol, Mass.

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Cone-Drive Gear Div., Michigan Tool Co., 7171
E. McNichols Rd., Detroit 12, Mich.
Farrel-Birmingham Co., Inc., 25 Main St.,
Ansonia, Conn.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Philadelphia Gear Works, Erie Ave., and G St.,
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Sier-Bath Gear & Pump Co., Inc., 9248 Hudson
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COUPLINGS, Shaft
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Cone-Drive Gear Div., Michigan Tool Co., 7171
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Link-Belt Co., 2045 W. Huntington Park Ave.,
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(Continued on page 352)

#### BENRUS OBTAINS

"WATCHMAKER'S PRECISION" STA

with

# PRODUCTO Catalog DIE SETS

Economy, at no sacrifice of production speed or quality, is the keynote of this Producto case history, which shows how the Benrus Watch Co., Inc., Waterbury, Connecticut, cut their stamping costs in the production of wrist watch "X-type" expansion bracelets. The secret, according to Benrus, lay in converting a Producto 2-pin catalog die set into a 4-pin die set suitable for this precise link stamping job. The conversion, which was quickly and easily made, gave Benrus a small, compact, and carefully balanced die set that lined up properly and permitted a unilateral load and vertical punch, with no problem of "winking." As a result, Benrus has been able to maintain consistently high-quality, high-speed stamping with extremely low per-hour and per-grind costs. Rejects have been reduced to an absolute minimum.

The specifications below tell the complete story.

PART: "X-type" Expansion Bracelet.

STAMPINGS: Top and bottom links (or liner parts) supporting outer shells.

MATERIALS — TOP LINK: Type 430 steel, dead soft, bright finish.

BOTTOM LINK: 85-15 rich low brass, dead soft.

TOLERANCE: Hole Locations — Both top and bottom ± .0005".

THICKNESS: Top — .018" Bottom — 030".

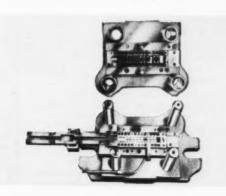
STATIONS: Top — 3. Bottom — 10.

PRODUCTION: Top — 6,000 pieces per hour. 50,000 pieces per grind.

Bottom — 6,000 pieces per hour. 75,000 pieces per grind.

OPERATIONS: Top — Pierce, pilot, blank.

Bottom — 6 draws, pierce, swedge, pilot, blank.





This special watchmaker die set, made by Producto to Benrus specifications, was used for stamping top links.

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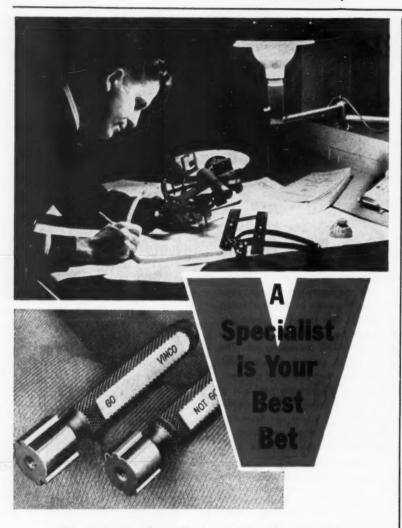
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Keo Cutters, 19326 Woodward, Detroit, Mich.
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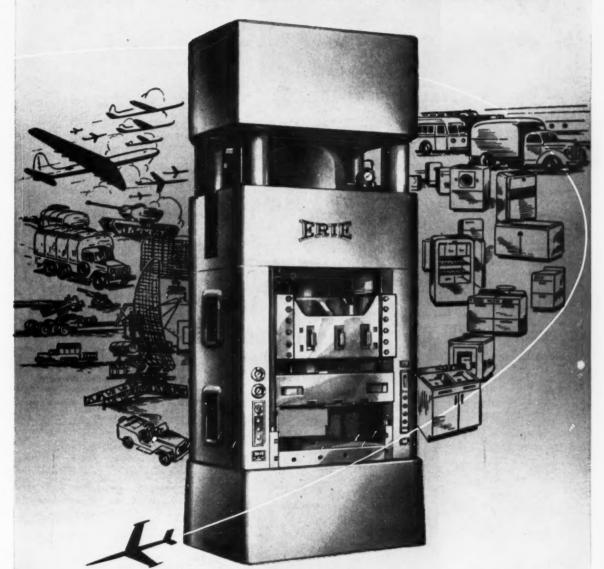
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Peerless Production Corp., 19449 Glendale
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8



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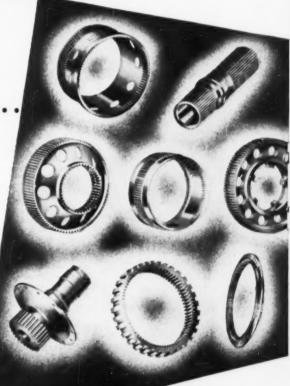
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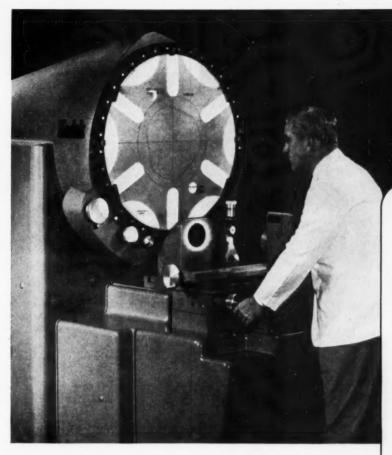
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(Continued on page 358)



# Now... a 30-inch Contour Projector with Kodak's Advanced Optical Design

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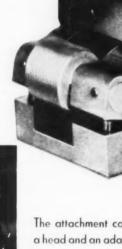
**Compact Design.** Floor space required for the Kodak Contour Projector, Model 30, is approximately 1/5 less than that required for other 30-inch projectors.

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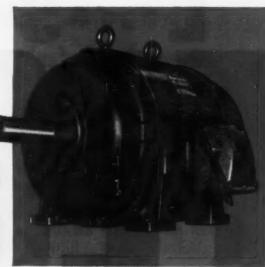
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(Continued on page 362)

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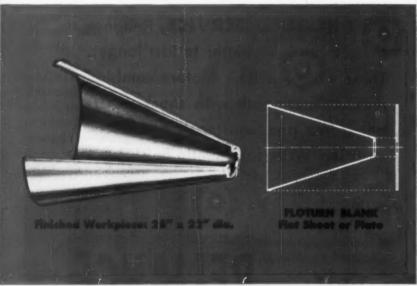
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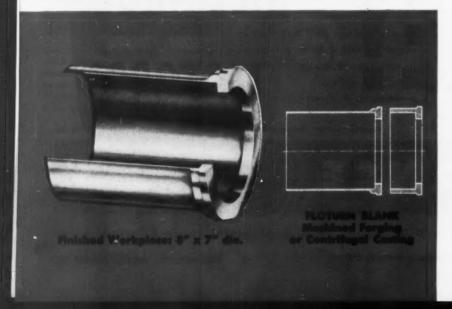
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MACHINERY, April, 1954-359

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... FLOTURN equipment scientifically applies great pressure against the blank, causes the metal to flow in a cold state. Pressure is spirally applied continuously, flowing the metal to the shape of a mandrel.

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- ...PRODUCES FORMS FROM EVEN NEWEST ALLOYS DIFFICULT TO MACHINE.
- ...ADDS STRENGTH AND HARDNESS TO FINISHED WORK.

#### FLOTURN SAVES TIME, MATERIALS, TOOLING

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. . . Steel . . . sheet, plate, bar stock or forgings

. . . All 300 and 400 series of stainless steel

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- ... Haynes Multimet
- ... Universal Cyclops Uniloy 19-9
- ... Inconel and Inconel-X
- . . . Monel and K-Monel
- ... Titanium T1-140-A

#### FLOTURN ADDS STRENGTH AND HARDNESS

...in direct contrast to drawing, FLOTURN increases part strength. For example, in working 302 stainless: tensile strength increased as much as 100%. After stress relief, 40% of increase was retained. Hardness increased from cold roll annealled to 57-59R 30N

#### DIFFICULT SHAPES ... FAST ...

... Conical, cylindrical, combination of the two and other complex shapes are easily formed by FLO-TURN. Tooling for any shape is low cost compared to conventional means.

... FLOTURN plus machining produces parts considered impractical before. Existing jobs are done faster, easier, at lower cost. Finished parts are stronger.

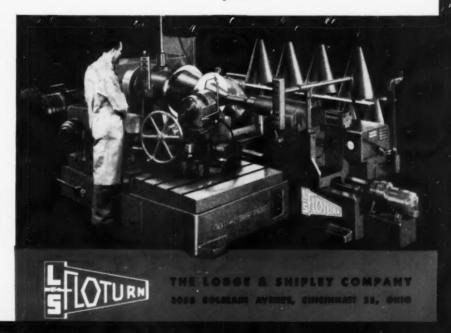
#### FLOTURN EQUIPMENT OR SUBCONTRACT SERVICE

Standard FLOTURN Lathes handle blanks 5/16" in thickness, 42" in diameter and 24" long on the No. 40 x 24" FLOTURN Lathe. Similar work up to 50" long can be handled on the No. 40 x 50" machine. Larger work may be handled on special FLOTURN equipment.

Lodge & Shipley sells FLOTURN equipment or will produce your parts on contract.

#### COMPLETE FLOTURN DETAILS ON REQUEST

... the FLOTURN process has been described in detail in leading publications. Send for reprints and complete literature on this exclusive Lodge & Shipley equipment and process.





# HYDRAULIC PRESS Makes New Product Possible

Tuttle & Bailey, Inc., New Britain, Conn., produces heating convectors, ceiling diffusers, grilles, registers, etc., as well as several defense products for the United States. When production of the ceiling diffusers was first planned, the company found they could not be manufactured with existing equipment at their plant.

Tuttle & Bailey then consulted with various hydraulic press companies, searching for a design to meet their requirements. Finally, the A. B. Farquhar Company came up with the best design-and at the lowest cost —a 450-ton press with pressing ram speed of 0 to 45 in./min., approach and return speed of 390 in./min., and operating hydraulic pressure of 2650 lbs./sq. in.

The company is very pleased with Farquhar's low maintenance cost, too. The press was installed in Aug. 1950, and has required no maintenance other than occasional gasket replacement.

#### Farguhar Presses Cut Your Costs

The above installation is just one more example of Farquhar performance in heavy production! Farquhar Presses are built-for-the-job . . . assure faster production due to rapid advance and return of the ram . . . greater accuracy because of extra-long guides on the moving platen . . . easy, smooth operation with finger-tip controls . . . longer life due to positive control of speed and pressure on the die . . . long, dependable service with minimum maintenance cost!

For our free catalog showing Farqu-har Hydraulic Presses in all sizes and capacities for all types of industry, write to: The OLIVER CORPORATION, A. B. FARQUHAR DIV., Hydraulic Press Dept., 1504 Duke St., York, Pa.



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Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Norton Co., I New Bond St., Worcester, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts.,
Bridesburg, Philadelphia, Pa.
Smit, J. K. & Sons, Inc., Murray Hill, N. J.
Walls Sales Corp., 333 Nassau Ave., Brooklyn
22, N. Y.

#### DISINTEGRATORS

Metalmaster Div., Clinton Machine Co., Clinton, Mich.

#### DIVIDING HEADS

See Indexing and Spacing Equipment

#### DOWELL PINS

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Danly Mch. Specialties, Inc., 2107 S. 52nd
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DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Producto Machine Co., 990 Housatonic Ave.,
Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St.,
Ampere, N. J.

#### DRAFTING MACHINES

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DRESSERS, Grinding Wheel
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Roosevelt Park Annex, Detroit 32, Mich.
Colonial Broach Co., P.O. Box 37, Harper Sta.,
Detroit 13, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
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Ohio.
El-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Hoglund Engra. & Mfg. Co., Inc., Berkeley
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Metal Carbides Corp., Youngstown, Ohio.
Meyers, W. F. Co., Bedford, Ind.
Moore Special Tool Co., Inc., 724 Union Ave.,
Bridgeport, Conn.
Norton Co., 1 New Bond St., Worcester, Mass.
Scherr, George Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13,
Mich.
Vinco Corp., 9113 Scheefer Hwy., Detroit 28. Super Tool Co., 21000 recover. Mich. Vinco Corp., 9113 Schaefer Hwy., Detroit 28, Mich.
Western Tool & Mfg. Co., 1640 E. Wheeler St.,
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Delta Power Tool Div., Rockwell Mfg. Co.,
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Errington Mechanical Laboratory, 24 Norwood
Ave., Stapleton, S. I., N. Y.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
Govro-Nelson Co., 1933 Antoinette St., Detroit
8, Mich. Govro-Nelson Co., 1933 Antoinette St., Detroit 8, Mich.
Moline Tool Co., 102 20th St., Moline, III.
Peerless Production Corp., 19449 Glendale Ave.,
Detroit 23, Mich.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.
Thirtmaster Products Corp., 1076 N. Plum St.,
Lancaster, Pa.
United States Drill Head Co., 616 Burns,
Cincinnati, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

(Continued on page 364)

(Continued on page 364)

OHIO FORGE AND MACHINE



eliminates two grinding operations

machining high precision diesel engine gear blanks



Machined on CHUCK-MATIC from A-4340 steel forging annealed.

1st operation: (on front side) Face hub and flange, form radius on O.D; bore and chamfer hole, turn O.D. partway. 2nd operation: (on other side) Face, finish bore and turn O.D. remainder.

# ON ACME-GRIDLEY CHUCK-MATICS



Acme-Gridley 12" Single Spindle CHUCK-MATIC is radically different from any other machine heretofore offered for short length primary operations such as forming, turning, drilling, straight or taper boring, facing, etc.

The NATIONAL ACME COMPANY

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ACME-GRIDLEY BAR and CHUCKING AUTOMATICS
1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines •
Automatic Threading Dies and Taps • Limit, Motor Starter and
Control Station Switches • Selegade • Contract Manufacturing

By switching these jobs to Chuck-Matics, Ohio Forge and Machine Corporation in Cleveland, Ohio, now machine tough forged blanks concentric within .0002"—hold tolerances which eliminate the green (or soft) grinds previously required on bore and O.D. before the teeth could be cut.

And they save, too, with automatic control of cycle time—a predetermined machining rate that you can count on for every piece.

#### This Radically Different Chucker

is built for high speed precision work on heavy duty jobs. Check these features against your present methods—

- automatic control of machine time cycle
- easy to set up and retool
- does not require skilled labor—one man operates as many machines as cycle times of jobs permit
- is space saving—only 45" wide, 64" long
- precision work at speeds and feeds as fast as carbide
  tools can take it.

—then write for catalog SC-46. Or, better still, ask us to talk it over.

Nothing so completely destroys profits as the continued use of obsolete equipment

#### cut your costs... where you cut your materials



Production managers who take the trouble to keep a careful, day-to-day record of cutting operations are quickly convinced of the efficiency and economy of the Allison Abrasive Cutting Method. The score is there for all to see. Abrasive cutting with Allison Wheels cuts time, cuts effort, and cuts waste. It pays off in more pieces per hour at a lower cost per piece. For almost all materials to be cut, there is an Allison Abrasive Cutting Wheel to fit the job. For complete information on wet or dry cutting, ask Allison . . . specialists in abrasive cutting for thirty years.



The best way to cut many materials . . the only way to cut some.



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DRILL HEADS, Unit Type

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Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee
St., Rockford, III.

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Standard Electrical Tool Co., 2488-90 River
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Thor Power Tool Co., Aurora, III.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

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Baker Bros. Inc., Station F, P.O. Box 101,
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Barnes, W. F. & John, Co., 201 S. Water St.,
Rockford, III.
Baush Machine Tool Co., 156 Wason Ave.,
Springfield 7, Mass.
Bodine Corp., Mt. Grove St., Bridgeport, Conn.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor,
Mich. Springfield 7, Mass.
Bodine Corp., Mt. Grave St., Bridgeport, Conn.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor,
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Hartford Special Mchry. Co., 287 Homestead
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Kingsbury Mch. Tool Corp., Keene, N. H.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
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National Automatic Tool Co., Inc., S. 7th and
N. Sts., Richmond, Ind.
Peerless Production Corp., 19449 Glendale Ave.,
Detroit 23, Mich.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale
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DRILLING MACHINES, Bench
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Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio. Foote-Burt Co., 1300 St. Clair Ave., Cleveland. (Continued on page 366)



Yes, let the tireless muscles of *air power* do your heavy work for you—let air be the force for pushing or pulling . . . lifting or lowering . . . opening or shutting in your plant.

Air is quick, convenient — and it will save you money, too. Try Schrader Air Cylinders to give you that push . . . or pull . . . or push and pull smoothly, quickly, and with less work than any other method you've ever tried.

Schrader Air Cylinders are itleal for any application where you heed straight-line forces for any distance from inches to feet ... at forces from less than 20 pounds to over 5,000 pounds. And they pack more power for their size and weight than any other commonly used type of power unit.

So-wherever you need a hefty push-or a gentle shove-or anything in between-think of Schrader Air Cylinders.

The possible uses of Schrader Air Cylinders in industrial plants are so numerous that it is impossible to do more than suggest their great utility and versatility. We'll be glad to give you specific recommendations, however, if you'll just write, outlining the processes used in your plant—or fill out the coupon below.

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# Automatic control

#### for winding and tensioning, at low initial cost without unnecessary bulk or expensive maintenance

Now available in improved design\*, and in larger capacity to extend the line, the new Twin Disc Model 12.2 and 8.4 Hydro-Wynd provides a more effective, more economical answer to automatic winding and tensioning control.

Extremely compact - easy to install-either the 12.2 or 8.4 Hydro-WYND combines a fluid coupling with a planetary gear set. Pre-determined tensions-once set-are maintained automatically, regardless of variations in the load demand . . . and with no further adjustments required. The result . . . bigber output per day . . . improved product quality . . . fewer man hours required.

For complete information on the new Hydro-Wynd, call your Authorized Twin Disc Hydraulic Dealer-or write Dept. DS, Racine, Wisconsin.

\*New HYDRO-WYND design features include rearrangement of gear train, better bearing spacing, and new carbon-against-steel springlooded seal

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Wales-Strippit Corp., N. Tonawanda, N. Y.

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Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Milholland, W. K. Mchry. Co., 6402 Westfield
Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, III.
Morris Machine Tool Co., Inc., 946-M Harriet
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National Automatic Tool Co., Inc., S. 7th and
N. Sts., Richmond, Ind.
Peerless Production Corp., 19449 Glendale
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Turner Bros., Inc., 2625 Hilton Rd., Ferndale
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Davis & Thompson Co., 6411 W. Burnham St.,
Milwaukee 14, Wis.
Edlund Machinery Co., Cortland, N. Y.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Kingsbury Mch. Tool Corp., Keene, N. H.
Milholland, W. K., Mchry. Co., 6402 Westfield
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Moline Tool Co., 102 20th St., Molline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet
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National Automatic Tool Co., Inc., 954-M Harriet
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National Automatic Tool Co., Inc., 97th and
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Baush Machine Tool Co., 156 Wason Ave.,

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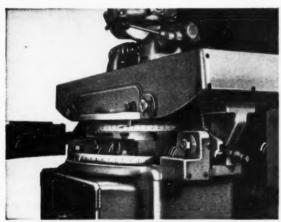
Snyder Tool & Engrg. Co., 3400 E. Lafayette,

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(Continued on page 368)



Differential up-feed mechanism



Crowning cam and bracket

Two new features are now optionally available with the Red Ring Gear Shaving Machine Model GCU — Automatic Differential Up-feed and Conventional Crowning. So equipped, any of the recognized processes in the field of rotary gear shaving may be performed on this machine. It thus becomes economically applicable to both high production and to job shop operations and to gears of all characteristics within its size range.

Specifically the Model GCU with these additions can be used for:

- Diagonal shaving at fixed center distance on a two stroke cycle.
- (2) Diagonal shaving on an automatic multi-stroke cycle with selected increments of up-feed and dwell.
- (3) Conventional shaving on an automatic multistroke cycle with selected increments of up-feed and dwell.
- (4) Precision gear crowning accomplished by rocking the table during any conventional shaving cycle.
- (5) Taper shaving to specification.

Automatic cycling is precise and very fast. Production rates are high and cutter life has been increased to as much as 200%.

Write for Bulletin S53-7 which gives all the details of this important new development.

6501



NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN . . . . . . . . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT



TIME YOU CHANGED **GRINDERS** 

# RI

built in '54 offer more improvements . . .

. . . improvements you can't afford to overlook, if your toolroom is to meet today's precision tooling demands-competently, quickly and profitably.

Finger-tip level controls for easier operation; one-piece column casting mounted on the base for maximum rigidity; hand-scraped ways for accuracy; telescoping dust plates for protection of vertical and cross feed mechanisms - these are but a few of the many improvements designed by our engineers to make Reid Grinders a standard of precision and dependability.

If your toolroom still harbors a surface grinder like those above, for the sake of efficiency,



#### PLAN NOW FOR REPLACEMENT!

Condensed specifications - Model 618V Capacity: 6" x 18" x 171/4" (spindle center to table) Work table: 51" x 8"

Power-feed table: variable, 12 to 35 ft./min. Standard wheel: 7" x ½" x ½" x ½"

Weight: 2100 lbs. Floor space: 71" x 431/2"



or write for copy Please request Catalog 618-2

#### DRILLING MACHINES, Multiple Center Column Type

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National Automatic Tool Co., Inc., S. 7th and
N. Sts., Richmond, Ind.
Peerless Production Corp., 19449 Glendale
Ave., Detroit 23, Mich.

#### DRILLING MACHINES, Multiple Spindle

DRILLING MACHINES, Multiple Spindle
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Baker Bros., Inc., Station F, P.O. Box 101,
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Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St.,
Rockford, Ill.
Baush Machiner Tool Co., 156 Wason Ave.,
Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo,
N. Y.
Burg Tool Mfg. Co., 3743 Durango Ave.,
Los Angeles 34, Cal.
Canedy-Otto Div., Cincinnati Lathe & Tool Co.,
Oakley, Cincinnati, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave.,
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Cincinnati Bickford Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
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Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machiner Tool Co., Inc., 946-M Harriet
St., Cincinnati 3, Ohio.
Notional Automatic Tool Co., Inc., 946-M Harriet
St., Cincinnati 3, Ohio.
Notional Automatic Tool Co., 1625 Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
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Detroit 7, Mich.
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Patt & Whitney, West Hartford 1, Conn.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.
Detroit 7, Mich.
South Bend, Ind.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale
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Zogar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio. Avey Drilling Mch. Co., 26 E. Third St., Cov-

#### DRILLING MACHINES, Radial

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Cincinnati Bickford Tool Co., 3220 Farrer Ave.,
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Cosa Corp., 405 Lexington Ave., New York 17,
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Foote-Burt Co., 1300 St. Clair Ave., Cleveland,
Ohio. Foote-Burt Co., 1300 St. Clair Ave., Cleveland, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Kaukauna Machine Corp., Kaukauna, Wis.
Modern Ind. Engrg. Co., 14230 Birwood Ave.,
Detroit 4, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet
St., Cincinnati 3, Ohio.
Onsrud Machine Works, Inc., 3940 Palmer St.,
Chicago, Ill.

DRILLING MACHINES, Rail See Drilling Machines, Gang

#### DRILLING MACHINES, Sensitive

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky. Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.

(Continued on page 370)

# AIR engineering provides the production pay-off!



I-R Air-Powered
Screw Drivers

- provide torque control
- save assembly time
- reduce spoilage
- eliminate operator fatigue

Here's one example. An electric clock manufacturer installed 3 Ingersoll-Rand Air-Powered Screw Drivers to fasten clocks to their cases. Production stepped up immediately on this operation. The three tools—costing \$315.—paid for themselves in 24 days!

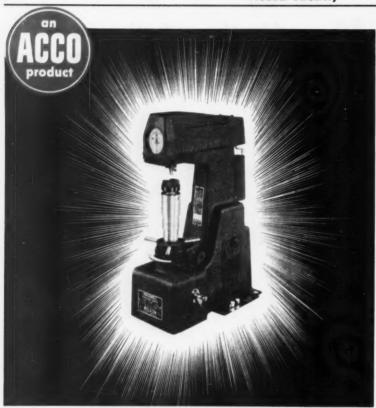
You'll never know how speedy and effortless fastening operations can be until you've tried these Ingersoll-Rand Screw Drivers. Let an I-R Air Engineer show how you can apply these same cost savings to your own operations. Ask him for specifications and full details on our complete line of straight or angle Screw Drivers.

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Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
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DRILLING MACHINES, Wall, Radial

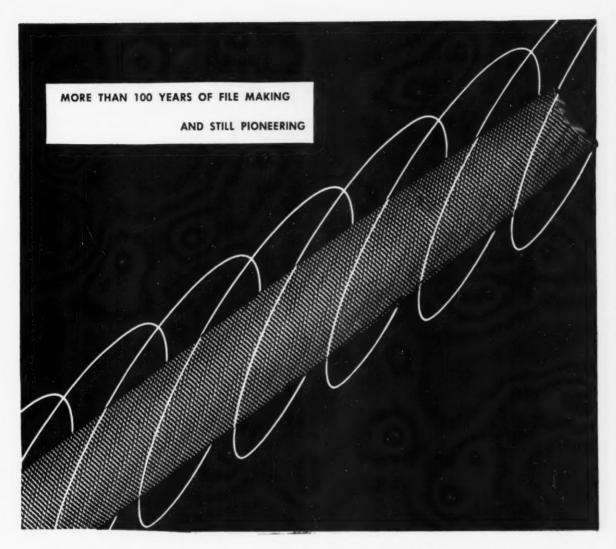
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio. Consolidated Mch. Tool Corp., Rochester, N. Y.

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DRILLS, Center
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, III.
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Greenfield Tap & Die Corp., Greenfield, Mass. Keo Cutters, 19326 Woodward, Detroit, Mich.
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Union Twist Drill Co., Athol, Mass.
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Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. (Continued on page 372)



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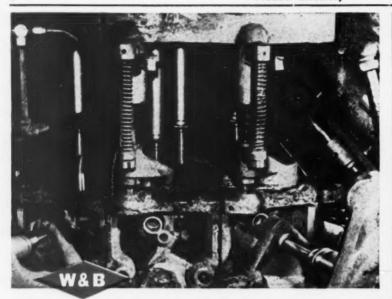
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This large manufacturer of automobiles selected W & B carbide drills as a means for increasing production of these cast iron oil pump bodies. Because W & B carbide drills have extra-long-life and provide more holes per grind, his drilling cost is reduced, there are fewer shut-downs for changing drills and maximum production time is obtained from each

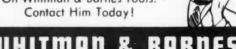
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Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.

Greenfield Tap & Die Corp., Greenfield, Mass.

National Twist Drill & Tool Co., Rochester, Mich. National Iwist Drill & 1000 Co., Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

DRILLS, Twist

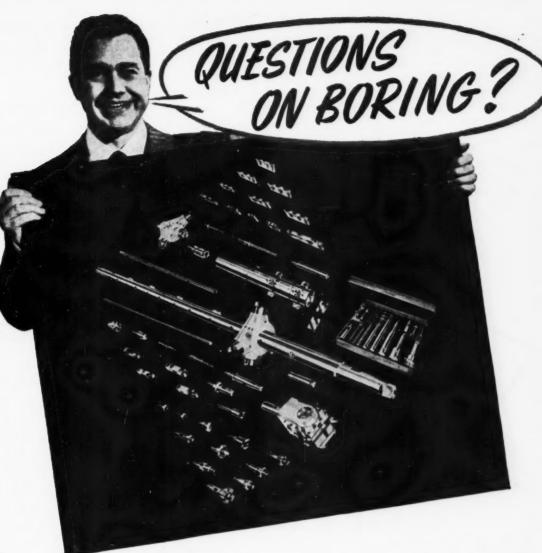
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Cleveland Twist Drill Co., 1242 E. 49th St.,
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DoAll Co., 254 N. Lourel Ave., Des Plaines, III.
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DRIVES, Chain Link-Belt Co., 220 S. Belmont Ave., Indian-apolis 6, Ind. (Continued on page 374)



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Have our qualified experts recommend the tooling that will give you the unusual capacity that pays off in money-making metalworking

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Yes, when your production gears need deburring and chamfering your answer is a Burr-Master. Capable of chamfering the entire tooth form and root, Burr-Masters are available in a wide range of models to meet every need.

No matter what the length of your production runs or the size gears to be chamfered, the Universal Burr-Master (shown) holds the answer to many of your finishing problems. The newest member of the Burr-Master line, it handles both spur and helical gears as well as straight and involute form external splines.

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(Continued on page 378)



# MILLHOLLAND **ENGINEERED** FOR MAXIMUM PRODUCTION

For special production machines, Millholland Automatic Units offer distinct ad-

arts machined at a time.

vantages. These self-contained units, driven by individual motors, are readily adapted to a wide range of eperations. Their full automatic cycle with interlocked controls permits several units to be grouped for simultaneous operations, or they can be mounted on other production machines and synchronized to perform additional operations. Millholland Automatic Units have proved themselves in 30 years of outstanding performance on all types of jobs. Get full details in Bulletin M-4.

#### W. K. MILLHOLLAND MACHINERY CO. 6402 Westfield Blvd., Indianapolis 2, Indiana

hole. Station 3—Combination spot face and chamfer (3) holes, drill (1) 23/32" hole for tapping. Station 4—Tap (3) 7/16"-14 NC-3 thread; tap 1/2"-14

Description: Milholland 4-station automatic index machine equipped with 4station automatic index table, with 1 No.

5 Millholland Automatic Unit driven by 7-1/2 HP motor with 8-spindle ball bearing multiple head for drilling 5 holes and

combination spot facing and chamfering 3 holes; 4-spindle tapper on right-hand

Operator loads part and pushes button initiating automatic cycle, unloads. Two

parts machined at a time.

NPSE throad.

column



● The Atlantic Die Casting Company specializes in aluminum die casting. Using hydraulic machines of its own design, this company turns out amazingly intricate parts at a high rate of production. But it was not always easy going.

There had been a problem of lubrication. The exceedingly high temperatures necessary for die casting made it difficult to lubricate machine parts in the area of the heated dies. Various expensive and complicated lubricating mixtures were tried. Under the high temperatures, the lubricants thinned and did not cling well to the hot surfaces. Oxidation of the lubricants produced deposits. Resulting troubles: sticking of machine parts, particularly ejector pins; staining of aluminum castings, down-time for cleaning.

Consulted on this problem, a Standard Oil lubrication specialist recommended the lubricant that had been developed by Standard Oil for just such high temperature applications: Syntholube Oil.

This unique product has made short work of the

lubrication troubles. It does not "run" from hot surfaces. Its unusual depolymerizing characteristic has prevented the formation of troublesome deposits. In addition to other lubricating benefits, Syntholube has eliminated the expense of using costly lubricating mixtures.

Standard's lubrication specialist, watch machine oper-

ator use the somewhat unique spray method devised to apply SYNTHOLUBE Oil to hot and hard to lubricate

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(Indiana)

Hanson-Whitney Co., Div., Whitney Chain Co., Hanson-Whitney Co., Div., Whitney Chain Co., Hartford, Conn.
Lufkin Rule Co., Hess Ave., Saginaw, Mich. Millers Falls Co., Greenfield, Mass.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio. Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol., Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

#### GAGES. Dial

Ames, B. C., Co., Waltham 54, Mass. Brown & Sharpe Mfg. Co., Providence, R. I. DoAll Co., 254 Laurel Ave., Des Plaines, III Federal Products Corp., P. O. Box 1027, Provi Federal Products Corp., P. O. Box 102/, Providence, R. I. Lufkin Rule Co., Hess Ave., Saginaw, Mich. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y. Sheffield Corp., 721 Springfield, Dayton, Ohio. Standard Gage Co., Inc., Poughkeepsie, N. Y. Starrett, The L. S., Co., Athol, Mass. Taft-Peirce Mfg. Co., Woonsocket, R. I.

#### GAGES, Electric

Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio. Cosa Corp., 405 Lexington Ave., New York 17. DoAll Co., 254 Laurel Ave., Des Plaines, Ill. Federal Products Corp., P. O. Box 1027, Provi-dence, R. I. Pratt & Whitney, West Hartford 1, Conn. Sheffield Corp., 721 Springfield, Dayton, Ohio.

#### GAGES, Height

GAGES, Height

Amco Gage Co., 19760 W. 8 Mile Rd., Detroit
19, Mich.

Ames, B. C., Co., Waltham 54, Mass.

Brown & Sharpe Mfg. Co., Providence, R. I.

Cleveland Instrument Co., 735 Carnegie Ave.,

Cleveland 15, Ohio.

DoAll Co., 254 Laurel Ave., Des Plaine, III.

Lufkin Rule Co., Hess Ave., Saginaw, Mich.

Pratt & Whitney, West Hartford I, Conn.

Scherr, George Co., Inc., 200 Lafayette St.,

New York 12, N. Y.

Sheffield Corp., 721 Springfield, Dayton, Ohio.

Starrett, The L. S., Co., Athol, Mass.

GAGES, Plug, Ring and Snap

AGLES, Plug, Ring and Snap

Amco Gage Co., 19760 W. 8 Mile Rd., Detroit
19, Mich.

Axelson Mfg. Co., P. O. Box 15335, Vernon
Sta., Los Angeles 58, Calif.

Brown & Sharpe Mfg. Co., Providence, R. I.

Carboloy Dept., General Electric Co., Box 237,
Roossevet Park Annex, Detroit 32, Mich.

Dearborn Gage Co., 22038 Beech St., Dearborn,
Mich.

Dearborn Guye Co., Mich. DoAll Co., 254 Laurel Ave., Des Plaines, III. Federal Products Corp., P. O. Box 1027, Providence, R. I. Firth Sterling Inc., 3113 Forbes St., Pittsburgh

dence, R. I.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hanson-Whitney Co., Div., Whitney Chain Co.,
Hartford, Conn.
Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York.
Kennametal Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Turner Bros. Inc., 2625 Hilton Rd., Ferndale
20, Mich.
Von Keuren Co., 176 Waltham St., Watertown,
Boston, Mass.
Vinco Corp., 9113 Schaefer Hwy., Detroit 28,
Mich.
Willay's Carbide Tool Co., 1340 W. Vernor Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit I, Mich.

GAGES, Surface

GAGES, Surface

Amco Gage Co., 19760 W. 8 Mile Rd., Detroit 19, Mich.

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Columbus Die-Tool & Mch. Co., 955 Cleveland
Ave., Columbus, Ohio.

DoAll Co., 254 Laurel Ave., Des Plaines, III.
Hanson-Whitney Co., Div. Whitney Chain Co.,
Hartford, Conn.

Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.

#### GAGES, Taper

Brown & Sharpe Mfg. Co., Providence, R. I. Dearborn Gage Co., 22038 Beech St., Dearborn, Mich. Pratt & Whitney, West Hartford 1, Conn. Sheffield Corp., 721 Springfield, Dayton, Ohio. Starrett, The L. S., Co., Athol, Mass. Taft-Peirce Mfg. Co., Woonsocket, R. I.

#### GAGES, Thread

GAGES, Thread

Axelson Mrg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.

Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.

DoAll Co., 254 Laurel Ave., Des Plaines, III. Federal Products Corp., P. O. Box 1027, Providence, R. I.

Greenfield Tap & Die Corp., Greenfield, Moss-Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.

Iroquois Corp., RFD 4 Box 331, 1800 E. 11 Mile Rd., Royal Oak, Mich.

Pratt & Whitney, West Hartford I, Conn.

Sheffield Corp., 721 Springfield, Dayton, Ohio. Taft-Peirce Mfg. Co., Woonsocket, R. I.

#### **GASKETS**

Crane Packing Co., 1800 Cuyler Ave., Chicago. Garlock Packing Co., Palmyra, N. Y.

#### GEAR BLANKS, Non-Metallic

Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y. General Electric Co., Schenectady 5, N. Y.

#### GEAR BURNISHING MACHINES

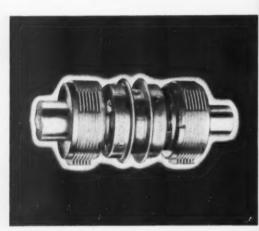
Fellows Gear Shaper Co., 78 River St., Spring-field, Vt. Gleason Works, 1000 University Ave., Roches-ter 3, N. Y. Sheffield Corp., 721 Springfield, Dayton, Ohio.

#### GEAR CHAMFERING, ROUNDING AND BURRING MACHINES

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa. Consolidated Mch. Tool Corp., Rochester, N. Y. Cross Co., 3250 Bellevue Ave., Detroit 7, Mich. 1217-35 Spring

(Continued on page 380)

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ROCKFORD CLUTCHES are carefully adjusted and accurately balanced to prevent drag or centrifugal force from affecting their smooth running operation. An electronic gauge checks the balance of each ROCK-FORD CLUTCH, within extremely close limits, before it passes final inspection.

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PROBLEM: The holes in this Meehanite valve sleeve at Village Gage Company have tolerances of .0005" on the 1.125" diameter (a blind hole), and .0002" on the .6255" diameter. Surface finish must be 2-6 micro-inches RMS. Lands must be perfectly aligned. These specifications assure sensitive, positive response to hydraulic control settings, without pressure drop or leakage.

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From wafer thin parts to extremely long inside diameters, Sunnen Honing Machines handle all shapes and sizes, usually without jigs or fixtures. They hone all metals (except babbit), plastics, ceramics, and glass. Accuracy is guaranteed to within .0001". Surface finish can be held as low as 2 micro-inches RMS in hardened steel. Diameter range is 1/8" to 25/8".

Average installation is under \$1,000—delivered and in operation within 3 weeks. Our field engineers continue to serve you year-'round, without charge. Write for more information.



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Fellows Gear Shaper Co., 78 River St., Spring-field, Vt.
Gleason Works, 1000 University Ave., Roches-ter 3, N., Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass. Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vinco Corp., 9113 Schaefer Highway, Detroit 28, Mich.

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#### GEAR CUTTING MACHINES Bevel Gears, Spiral

Gleason Works, 1000 Unversity Ave., Rochester 3, N. Y. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

#### GEAR CUTTING MACHINES, Spur and **Bevel Gears (Rotary Cutter)**

Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y. Waltham Machine Works, Newton St., Wal-tham, Mass.

GEAR CUTTING MACHINES, Spur and Helical Gears (Hobbing)

Barber-Colman Co., Rock and Montague, Rock-ford, III.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

#### GEAR CUTTING MACHINES, Spur and Helical Gears (Shaper or Planer Type)

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#### GEAR CUTTING MACHINES, Worm and Worm Wheels

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Cone-Drive Gear Div., Michigan Tool Co., 7171
E. McNichols Rd., Detroit 12, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt. (Straight and Hourglass Types).
Michigan Tool Co., 7171 E. McNichols Rd.,
Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut
Ave., Hillside, N. J.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y. 111.

#### GEAR FINISHING MACHINES

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#### GEAR GRINDING MACHINES

GEAR GRINDING MACHINES
Cosa Corp., 405 Lexington Ave., New York 17.
Gear Grinding Machine Co., 3901 Christopher
St., Detroit 11, Mich.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
National Broach & Mch. Co., 5600 St. Jean
Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland. Ohio. land, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Van Norman Co., Springfield, Mass.

#### **GEAR HARDENING MACHINES**

Gleason Works, 1000 University Ave., Rochester 3, N. Y.

#### **GEAR LAPPING MACHINES**

Fellows Gear Shaper Co., 78 Rover St., Spring-field, Vt. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

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#### GEAR SHAVING MACHINES

Fellows Gear Shaper Co., 78 River St., Spring-field, Vt. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

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Pa.

Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Farrel-Birmingham Co., Inc., 25 Main St.,
Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. ichigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. (Continued on page 382)

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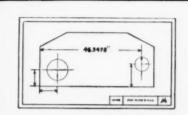
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ASTE EXHIBITION BOOTH 1201

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#### GEARS, CUT

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Automotive Gear Works, Inc., Richmond, Ind. Boush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bligram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Brad Foote Gear Works, 1309 S. Cicero Ave., Cicero 50, III.
Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio. Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio. Cone-Drive Gears Div., Michigan Tool Co., 7200 E. McNichols Rd., Detroit, Mich. Dietendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y. Gore, 1920 N. Belden Ave., Syracuse, N. Y. Grariel-Brimingham Co., Inc., 25 Main St., Ansonia, Conn. Franke Gear Works, Inc., 1924 W. Columbia Ave., Chicago 26, III. Gear Specialties Inc., 2635 W. Medill Ave., Chicago 47, III. Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio. Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn. Illinois Gear & Mch. Co., 2120 No. Natchez Ave., Chicago 35, III. Mass. Gear & Tool Co., 36 Nassau St., Woburn, Mass. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. National Broach & Machine Co., 5600 St. Jean St., Detroit 13, Mich. New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J. Cleveland Worm & Gear Co., 3249 E. 80th St.,

Perkins Machine & Gear Co., West Springfield, Mass.
Philadelphia Gear Works, Erle Ave., and G St., Philadelphia, Pa.
Philadelphia, Pa.
Pittsburgh Gear Co., 2700 Smallman St., Pittsburgh, Pa.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

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Boston Gear Works, 3200 Main St., North Quincy, Mass.
Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
Diefendorf Gear Corp., 920 N. Beldon Ave., Syracuse, N. Y.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, III.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Hortford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ohio Gear Co., 1333 E. 179th St., Cleveland.
Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.
Pittsburgh Gear Co., 2700 Smallman St., Pittsburgh Gear Co., 2000 Mallman St., Pittsburgh, Pa. Pittsburgh Gear Co., 2700 Smallman St., Pitts-burgh, Pa. Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio. Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

#### **GENERATORS**, Electric

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Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Greaves Mch. Tool Co., 2009 Eastern Ave.,
Cincinnati Ohio. Gorton, Geo., Mch Racine, Wis. Greaves Mch. Tool Cincinnati, Ohio.

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Houghton, E. F., & Co., 303 W. Lehigh Ave.,
Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 129
Lockwood St., Newark 5, N. J.
Sinclair Refining Co., 600 5th Ave., New York,
N. Y. Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, III.
Sun Oit Co., 1608 Walnut St., Philadelphia.
Texas Co., 135 E. 42nd St., New York, N. Y.

#### GRINDERS, Carbide Tool

See Grinding Mches, Carbide Tool

#### **GRINDERS**, Centerless

Van Norman Co., Springfield, Mass.

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Thor Power Tool Co., Aurora, III.

#### GRINDERS, Oilstone, for Woodworking

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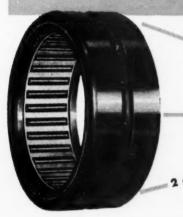
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**NEEDLE BEARINGS** 

Eliminate extreme wear and overheating of gears and shafts in CONTINENTAL No. 12 STEEN High-speed, Air-operated Pipe and Tube Cut-off Machines



<sup>8</sup> on Idler Gears

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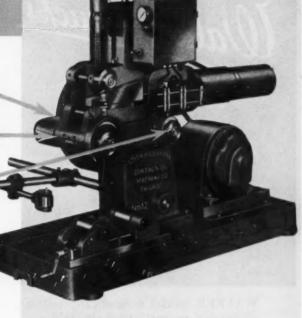
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The success of Orange Cage Type Needle Bearings in this tough application, like so many others, is the result of

- High load capacity in small space
   PLUS
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With the cage assuring constant alignment of rollers, Orange Cage Type Needle Bearings are true running in any position—vertical, horizontal, tilted or on overhung mountings. They are less affected by misaligned mountings or uneven loading. Extremely quiet, smooth running.

Get these advantages of the Orange cage design for your next needle bearing installations. Sizes from  $\frac{1}{2}$ " to 8" shaft dia., interchangeable with standard heavy-duty needle bearings. Write for Engineering Data Folder.



Finding bearings that could meet space limitations, yet stand up under heavy conditions of cutting pipe and tube up to 1234" O. D. and 3/8" wall, was a troublesome problem.

Finally, an installation using Orange Cage Type Needle Bearings proved so successful, that all drive shafts, cutter shafts and idler gears are now standardized on Orange bearings. The Continental Machine Co., Chicago, Ill., reports not a single complaint after one and a half years' continuous service.



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Millers Folls Co., Greenfield, Mass.
South Bend Lathe Works, Inc., 425 E. Madison
St., South Bend, Ind.,
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Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.

Ohio.

Metal Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.

Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

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GRINDING MACHINES, Bench
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Delta Power Tool Div., Rockwell Mfg. Co.,
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Gorton, George, Mch. Co., 1110 W. 13th St.,
Racine, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Millers Falls Co., Greenfield, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.

Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, III. Thor Power Tool Co., Aurora, III. Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

#### GRINDING MACHINES, Broach

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Carboloy Dept., General Electric Co., Box 237,
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Cosa Corp., 405 Lexington Ave., New York 17,
N. Y.
Delta Power Tool Div., Rockwell Mfg. Co.,
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DoAll Co., 254 N. Laurel Ave., Des Plaines,
III. III. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Hammand Machinery Builders, Inc., 1600 32, Mich.

Hammond Machinery Builders, Inc., 1600

Douglas Ave., Kalamazoo 54, Mich.

Oliver Instrument Co., 1410 E. Maumee St.,

Adrian, Mich.

Orban, Kurt, Co., Inc., 205 East 42nd St., New

York 17, N. Y.

Sheffield Corp., 721 Springfield, Dayton, Ohio.

Willey's Carbide Tool Co., 1340 W. Vernor

Hwy., Detroit 1, Mich.

#### GRINDING MACHINES, Centerless

Cincinnati Grinders, Inc., Cincinnati, Ohio. Heald Machine Co., 10 New Bond St., Wor-cester 6, Mass. Landis Tool Co., Waynesboro, Pa.

#### GRINDING MACHINES, Chucking

Baird Machine Co., 1700 Stratford Ave., Strat-Baird Machine Co., 1700 Stratter Ass., strat-ford, Conn.
Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Bullard Co., Brewster St., Bridgeport, Conn. Landis Tool Co., Waynesboro, Pa.

#### **GRINDING MACHINES, Crankshaft**

Landis Tool Co., Waynesboro, Pa. Norton Co., 1 New Bond St., Worcester 6, Mass.

#### GRINDING MACHINES, Cylindrical

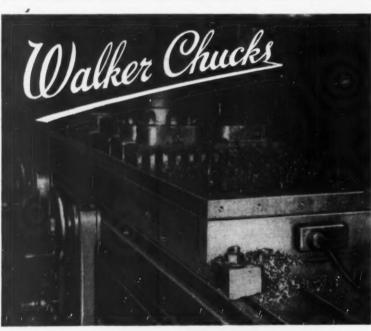
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass. Brown & Sharpe Mfg. Co., Providence, R. I. Cincinnati Grinders, Inc., Cincinnati, Ohio. Cosa Corp., 405 Lexington Ave., New York 17, N. Y. N. Y.
Frauenthal Div., Kaydon Engineering Corp.,
Muskegon, Mich.
Landis Tool Co., Inc., Waynesboro, Pa.
Norton Co., I New Bond St., Worcester 6,
Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Van Norman Co., 2640 Main St., Springfield 7,
Mass.

#### GRINDER MACHINES, Die Chaser

Eastern Mch. Screw Corp., New Haven, Conn. Landis Machine Co., Waynesboro, Pa.

#### GRINDING MACHINES, Disc

Besley-Welles Corp., Beloit, Wis.
Gardner Machine Co., 414 E. Gardner St.,
Beloit, Wis.
Hammond Machinery Builders, Inc., 1600
Douglas Ave., Kalamazoo 54, Mich.
Mattison Machine Works, Rockford, Ill.
(Continued on page 386)



#### WALKER special magnetically controlled chuck eliminates magnetization of tool and machine

The unusual feature of this outstanding advance is chip control in milling and planing operations. This powerful special chuck holds for intermittent cuts on rough steel castings using approximately 50% of the available contact area between work and chuck face. Another notable O. S. Walker accomplishment.

#### Hold Everything with Walker Chucks

Original Designers and Builders of Magnetic Chucks

# NOW...a new addition to the famous HANSON processes



See this new money saving inspection tool demonstrated at our Booth #414 at the A.S.T.E. Show in April.

This new Hanson-Whitney Internal Thread Comparator provides fast, accurate, economical, visual gaging of all forms and classes of internal threads in diameters ranging from 3/8" to 11/2". Thread segments are quickly interchangeable for inspecting other types, sizes and forms of threads. Accumulated errors of lead and pitch diameter can be analyzed by using the H-W Comparator with special two-thread segments.

Recognized Hanson standards of quality are embodied in the new H-W Internal Thread Comparator. All movable parts are hardened, ground and lapped to precision tolerances-thread segments will outlast several plugs. Exclusive actuating principle insures long-life accuracy.

Your nearest Hanson-Whitney representative will gladly show you how to reduce your gaging costs with the new Hanson-Whitney Internal Thread Comparator.

HANSON-WHITNEY COMPANY

Division of Whitney Chain Company, Hartford 2, Connecticut, U. S. A.

For more information on products advertised, use Inquiry Card, page 261

MACHINERY, April, 1954-385

#### GRINDING MACHINES, Drill

Blake, Edward Co., 442 Cherry St., West Newton 65, Mass.

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa. Gailmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.

Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazao 54, Mich.

Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.

Cliver Instrument Co., 1410 F. Maymen St.

Lehigh Foundries, Inc., 1885.
Easton, Pa.
Oliver Instrument Co., 1410 E. Maumee St.,
Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New
York 17, N. Y.
Union Twist Drill Co., Athol, Mass.

#### GRINDING MACHINES, Face

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Besly-Welles Corp., Beloit, Wis.
Columbia Div., Lodge & Shipley Co., Hamilton I, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.

Mattison Machine Works, Rockford, III.
Oliver Instrument Co., 1410 E. Maumee St.,
Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New
York 17, N. Y.

GRINDING MACHINES, Flexible Shaft See Flexible Shaft Equipment

#### GRINDING MACHINES, Gop

Cincinnati Grinders, Inc., Cincinnati, Ohio. Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Gear Tooth See Gear Grinding Machines

#### **GRINDING MACHINES For Sharpening** Cutters, Reamers, Hobs, Etc.

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Brown & Sharpe Mfg. Co., Providence, R. I.

Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York
17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co.,
614G N. Lexington Ave., Pittsburgh 8, Pa.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Goilmeyer & Livingston Co., 336 Straight Ave.,
S. W. Grand Rapids 4, Mich.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Gotton, Ge., Mch. Co., 1110 W. 13th St.,
Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St.,
Rockford, Ill.
Landis Tool Co., Waynesboro, Pa.
LeBlond, R. K., Mch. Tool Co., Madison and
Edwards Rds., Cincinnati 18, Ohio.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Oliver Instrument Co., 1410 E. Maumee St.,
Adrian, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St.,
Chicago, Ill.
Pratt & Whitney, West Hartford I, Conn.

Onsrud Machine Works, Its., 3787 Chicago, III.
Prott & Whitney, West Hartford 1, Conn.
Thompson Grinder Co., 1500 W. Main St.,
Springfield, Ohio.
Union Twist Drill Co., Athol, Mass.

#### GRINDING MACHINES, For Sharpening **Turning and Planing Tools**

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa. DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Hommond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich. Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich. Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y. South Bend, Ind. Vark 17, N. Y. South Bend, Ind. Walker, O. S., Co., Inc., Worcester, Mass. Walker, O. S., Co., Inc., Worcester, Mass. Waltham Machine Works, Newton St., Waltham, Mass.

#### GRINDING MACHINES, Internal

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Arter Grinding Mch. Co., 15 Sagamore Rd.,
Worcester 5, Mass.
Bryant Chucking Grinder Co., 257 Clinton St.,
Springfield, Vt.
Columbia Div., Lodge & Shipley Co., Hamilton
1, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17,
N. Y. N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit,
32, Mich.
Frauenthal Div., Kaydon Engineering Corp.,
Muskegon, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Orban, Kurt, Co., Inc., 205 East 42nd St., New
York 17, N. Y.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.
Wicaco Machine Corp., Stentan Ave. and Louden St., Philadelphia, Pa.

#### GRINDING MACHINES, Jig

Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn. Pratt & Whitney, West Hartford 1, Conn.

#### GRINDING MACHINES, Knife and Shear

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Columbia Div., Lodge & Shipley Co., Hamilton I, Ohio.
I, Ohio.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Mattison Machine Works, Rockford, III.
United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio.

#### GRINDING MACHINES, Piston Ring

Besly-Welles Corp., Beloit, Wis. Gardner Machine Co., 414 E. Gardner St., Beloit, Wis. Heald Machine Co., 10 New Bond St., Worces-ter 6, Mass. Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo. Mattison Machine Works, Rockford, III. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

(Continued on page 388)



The machine that uses its Head ....

... designed for short, intermediate or long runs

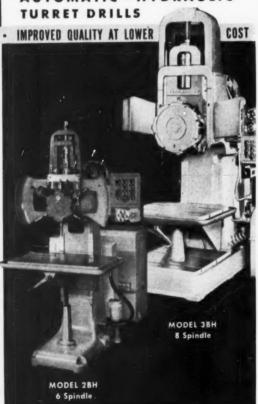
... featuring

infinitely variable pre-selective feeds pre-selective spindle speeds precision depth control skip indexing simple controls easy set-up low maintenance cost

> one man can operate one or more machines

> > further information

saves floor space



BURG TOOL MANUFACTURING CO., INC. DEPT. M4

3743 DURANGO AVENUE, LOS ANGELES 34, CALIFORNIA See our display at the ASTE Show—Booth No. 1635



TEE-SLOT on TRACER-HEAD ac-commodates standard or quick change tool holders, square tur-rets, planer clapper box, grinding



**BULLARD OPERATIONS** - including outside and inside tracing. Tracer-head adapts to



CONTOUR GRINDING

including internal and external contours.

ee Lehigh TRACER-TOOL DEMONSTRATED ASTE INDUSTRIAL EXPOSITION Booth No. 1355 AIR CONTROL DIVISION OF

Lehigh Foundries, Inc.

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# Faster-lower cost LATHE DUPLICATING WITH ANY ENGINE OR TURRET LATHE

- No complicated electronic or hydraulic controls.
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- · Positive stylus contact assured by air pressure to tool through a 3-way valve and pressure regulator. Uses shop pressure.
- Horizontal slide on Tracer Head operates between pre-loaded ball bearings. Precision built.
- · Uses easily made, low cost, hardened templates.
- · Proved in hundreds of shops of all sizes and in scores of major manufacturing and service industries for short and production runs.

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EL-1100	to	fit	lathes	9"-14" Price	\$375
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Prices subject to change without notice • Tool holder and template not included • Air valve and regulator supplied only with Models M-1500 and EL-2000.

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sive pieces are ma-chined or cuts are made. Speeds production. Assures accuracy even on eld worn

- and tapering. Unlimited radil.



CONTOUR FACING or any engine or turret lathe.



I.D. BORING consisting of various blended radii as well as 90° steps.

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Cleveland Grinding Machine Co., 1643 Eddy
Rd., Cleveland 12, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
Ex-Cello-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St.,
New York 17, N.,
Sheffield Corp., 721 Springfield, Dayton, Ohio.

## GRINDING MACHINES, Ring Wheel Ball Race, Etc.

Besly-Welles Corp., Beloit, Wis. Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich. Landis Tool Co., Waynesboro, Pa. Van Norman Co., Springfield, Mass.

# GRINDING MACHINES, Radial

Columbia Div., Lodge & Shipley Co., Hamilton I, Ohio. Consolidated Mch. Tool Corp., Rochester, N. Y. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

# GRINDING MACHINES, Radius, Link

Besly-Welles Corp., Beloit, Wis. Gardner Machine Co., 414 E. Gardner St., Beloit, Wis. Mattison Machine Works, Rockford, III. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

# GRINDING MACHINES, Roll

Farrel-Birmingham Co., 25 Main St., Ansonia Conn.
Conn.
Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6,
Mass. GRINDING MACHINES, Spline Shaft Van Norman Co., Springfield, Mass.

# **GRINDING MACHINES, Surface**

GRINDING MACHINES, Surface

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Arter Grinding Mch. Co., 15 Sagamore Rd.,
Worcester 5, Mass. (Rotary)
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Besly-Welles Corp., Beloit, Wis.
Blanchard Machine Co., 64 State St., Cambridge, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio
Delta Power Tool Div., Rockwell Mfg. Co.,
614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Frauenthal Div., Kaydon Engineering Corp.,
Muskegon, Mich.
Gardner Machine Co., 414 E. Gardner St.,
Beloit, Wis.
Gollmeyer & Livingston Co., 336 Straight Ave.,
S. W., Grand Rapids 4, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.

Herr o, Muss., And the Co., 1201 W. 65th St., Cleveland 2, Ohio.

Mattison Machine Works, Rockford, Ill., And this Machine Works, Rockford, Ill., Norton Co., 1 New Bond St., Worcester 6, Mass.

Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

Pratt & Whitney, West Hartford 1, Conn.

Reid Bros. Co., Inc., Beverly, Mass.

Sheffield Corp., 721 Springfield, Dayton, Ohio.

Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

Taft-Peirce Mfg. Co., Woonsocket, R. I.

Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.

Thor Power Tool Co., Aurora, Ill.

Walker, O. S., Co., Inc., Woorcester, Mass.

# GRINDING MACHINES, Top

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.

# GRINDING MACHINES, Thread

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt. Landis Machine Co. (Centerless), Waynesboro, Landis Machine Co. (Centerless), Waynesboro, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

# GRINDING MACHINES, Universal

Brown & Sharpe Mfg. Co., Providence, R. I. Cincinnati Grinders, Inc., Cincinnati, Ohio. Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich. Landis Tool Co., Waynesboro, Pa. Norton Co., I New Bond St., Worcester 6, Mass.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

# GRINDING MACHINES, Worm

Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt. Pratt & Whitney, West Hartford 1, Conn.

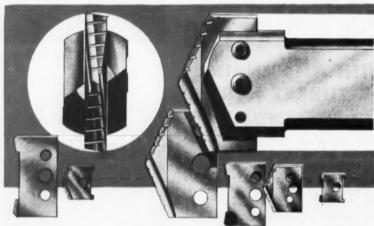
# GRINDING WHEELS

Allison Co., Bridgeport, Conn.
Besty-Welles Corp., Beloit, Wis.
Blanchard Machine Co., 64 State St., Cambridge, Mass.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Cincinnatl Milling Machine Co., Grinding Wheels Div., Cincinnati Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Gardner Machine Co. (Surface Grinder), 414 E.
Gardner St., Beloit, Wis.
Norton Co., 1 New Bond St., Worcester 6,
Mass.
Simonds Abrasive Co., Tacony and Fraley Sts.,
Bridesburg, Philadelphia, Pa.
Smit, J. K. & Sons, Inc., Murray Hill, N. J.

# GROOVE PINS

Gillen, John, Co., Inc., 2540 S. 50th Ave., Cicero 50, III.

(Continued on page 390)



# **Drill Large Holes from the Solid** with Interchangeable Spade Drills

Made in 256 cutter sizes, 1 to 5 inch diameter, in steps of 1/4, Conner type Spade Drills drill the required diameter in one operation, need no retracting to clear them of chips. Only eight sizes of holders are needed to handle all cutter sizes.

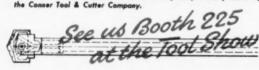
For general purpose work and in the Tool Room, use the cutter and holder assembly shown above. It is a rugged tool of great rigidity, recommended for large holes of medium depth.

For Production Drilling (for repetitive work), and for the somewhat deeper holes, use Conner type Oil Hole Holders designed for easy coolant flow and fast chip expulsion.

Send for Catalog and Price List

For Boring: Core Drill Cutters, for semi-finishing of cored and drilled holes, are made in the same 256 sizes, to fit the same spade drill holders.

The Gairing Tool Company is now the exclusive manufacturer of the Spade and Core Drills, both standard and special, formerly made by the Conner Tool & Cutter Company.



In Canada: A. C. Wickman (Canada) Ltd., Queensway, Toronto 14

# The GAIRING Tool Company

21225 Hoover Road

Detroit 32, Mich.

# now you can get a finish

LAPOINTE BROACHING

far superior to any finish ever before obtainable . . .

and 400% increased tool life!

The reason? . . . smoothness of operation

through the ELECTRO-MECHANICAL DRIVE

This machine is massive, weighing something over 30 tons without tools.

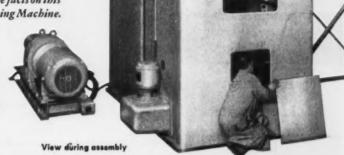
Slides are unusually heavy. The main drive gear, powered by a constant torque variable speed D.C. Motor, drives the broaches so smoothly that you not only get an amazing finish but increased tool life as well.

# for HIGH PRODUCTION BROACHING

of these and other parts, you should get all the facts on this newest LAPOINTE Electric Drive Broaching Machine.

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This LAPOINTE Double Ram Vertical Electro-Mechanical Drive Broaching Machine is producing a remarkably fine finish on 5 816 steel plus 4 to 5 times greater tool life for one of the largest manufacturers of liet burdes and burdens.



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THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

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# HAMMERS, Forging Air

Chambersburg Engrg. Co., Chambersburg, Pa. Lobdell United Co., 200 "G" St., Wilmington 99, Del.

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### HAMMERS, Power

Chambersburg Engrg. Co., Chambersburg, Pa. Lobdell United Co., 2000 "G" St., Wilmington 99, Del.

# HAMMERS, Shaft

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Ohio Crankshaft Co., 3800 Harvard Ave.,
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# HOBS

Barber-Colman Co., Rock and Montague, Rockford, III.
Brown & Sharpe Mfg. Co., Providence, R. I.
Hanson-Whitney Co., Div., Whitney Chain Co.,
Hartford, Conn.
Michigan Tool Co.,
Detroit 12, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester,
Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut
Ave., Hillside, N. J.
Union Twist Drill Co., Athol, Mass.

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# HOISTS, Air

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J. Keller Tool Co., Grand Haven, Mich. Thor Power Tool Co., Aurora, III.

HOISTS, Chain, Etc. Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, III.

# HOISTS, Electric

Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa. (Continued on page 394)

# for fast precision internal finishing of bores

# HONING MACHINES

15 sizes, diameters from 1/4" to 30" with strokes from 12" to 84"

Ferrous, non-ferrous metals, plastics, glass and other materials are finished straight and round to tolerances as close as .0001 (±). Chips run as long as six inches for fastest, most economical

> WRITE FOR BULLETIN ON HONING

# HONING FIXTURES

designed for your special purposes

**FULMER SUPPLIES YOUR** HONING NEEDS "ALL IN ONE PACKAGE"

HONING TOOLS sizes to 50

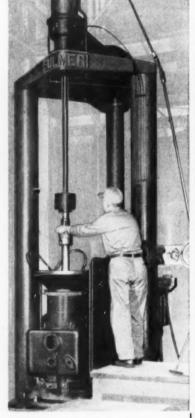


Photo taken in Continental Gin Co., Birmingham, Ala. honing Diesel cylinders.

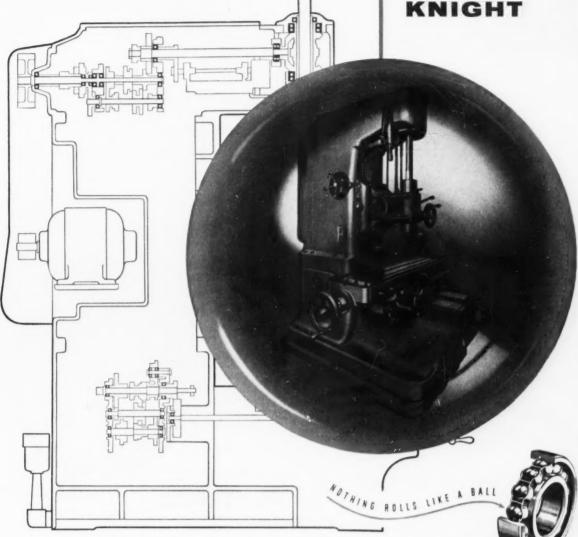
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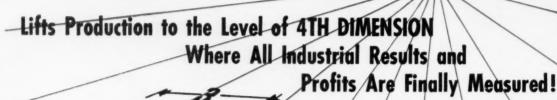
SYRACUSE

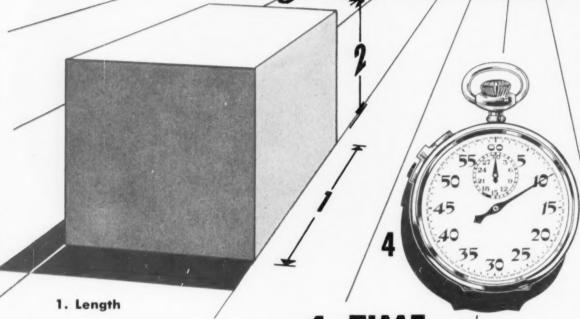
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| CLEVELAND | 3113 W. 110th 51, Wishon 1-5454
| INDIANAPOLIS | 1357 W. 18th 51, Imperial 4680
| PITTSBURGH | Cathedral Mansions | Mayflower 1-8100
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You're careful about 3-dimensional accuracy, of course. Precision to four decimal places in screw-machine output is commonplace. But bow about TIME, the important fourth dimension? Measurement that determines all industrial results, costs, profits.

2. Height

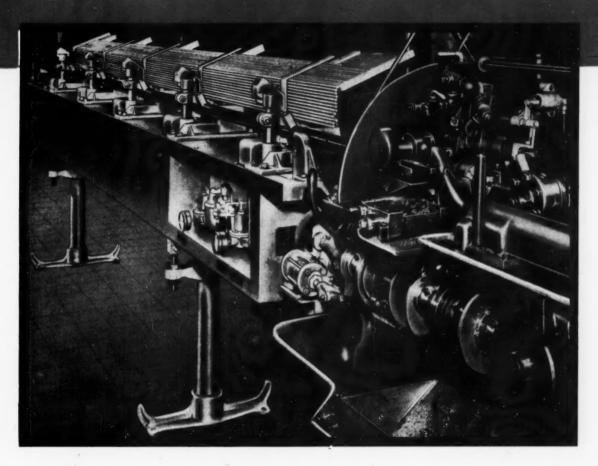
3. Width

Production is a succession of motions, cycles, piece-to-piece operations. But it's the overall result in world time, the plant output of finished pieces per hour, day and week which add up to the absolute reality of success or failure, profit or loss.

In this modern Lipe Automatic Magazine-Loading Bar Feed, we present an automatic feed that derives from every man and every machine a smooth flow of operations, a steady-state succession of events in world time which mathematicians, scientists and philosophers know as the *Fourth Dimension*.

Actual production increases per man hour and machine dollar may seem large in contrast to your present output. But remember the Lipe AML Bar Feed gears a succession of normally non-uniform cycles to the steadily moving stream of TIME... the dynamic 4th DIMENSION of both the production line and the universe.

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(Continued on page 396) (Continued on page 396)



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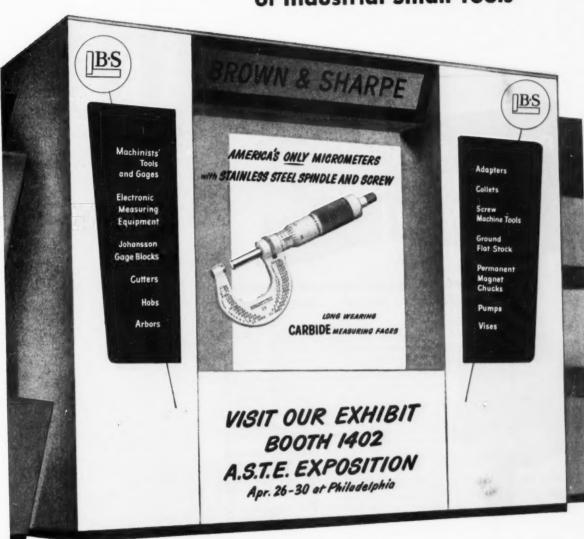
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(Continued on page 400)

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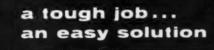
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Rivett Lathé & Grinder, Inc., Brighton, Boston 35, Mass. Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y. South Bend Lathe Works, 425 E. Madison St., South Bend, Ind. Springfield Mch. Tool Co., Springfield, Ohio. Warner & Swassey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

# LATHES, Vertical Turret

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincin-Paddock Kd. Grad Followship Paddock Rd. Grad Followship Paird Machine Co., 1700 Stratford Ave., Stratford, Conn. Bullard Co., Brewster St., Bridgeport 2, Conn. Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

# LAYOUT FLUID

Dykem Co., 2303 P. North 11th St., St. Louis 6, Mo.

# LEVELS

Bullard Co., Brewster St., Bridgeport 2, Conn. Lufkin Rule Co., Hess Ave., Saginaw, Mich. Millers Falls Co., Greenfield, Mass. Pratt & Whitney, West Hartford 1, Conn. Starrett, The L. 5., Co., Athol, Mass. Taft-Peice Mfg. Co., Woonsocket, R. 1. (Continued on page 402)

# NO GETTING AROUND IT

# A DE LAVAL OIL PURIFIER WILL PROTECT HYDRAULIC MECHANISMS

A De Laval Oil Purifier removes all moisture from hydraulic oil by means of centrifugal force. This is an important safeguard to good performance for any hydraulic press or other hydraulic mechanism, for even a small amount of water can ruin a mechanism, causing valves to stick and leather seals to harden.

De Laval centrifugal machines likewise remove the solid impurities in oil that score cylinders and do other costly damage. They are more effective than any other purification means . . . and save tools . . . dies . . . work . . . machines from damage.

You save more than the oil when you purify with De Laval.

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THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5



# DE LAVAL



**PURIFIERS AND CLARIFIERS FOR FACTORY OILS** 

For more information on products advertised, use Inquiry Card, page 261

MACHINERY, April, 1954-401

# WELDED DESIGN **ELIMINATES BREAKAGE CUTS COST 78%**

SINCE steel is a ductile material, it withstands shock loads without fracture. As a result, to eliminate shock failures, machine components can be simply changed to welded steel construction. At the same time, manufacture is made simpler, material cost is less, and fewer manhours are needed for production to cut costs an average of 50%.

# The Problem

In the examples shown, breakage in the flipper assembly created service problems for this company. Because of limited clearance, it was impossible to increase wall sections.

# The Solution

By converting to welded steel construction, the manufacturer was able to eliminate breakage completely, yet cut his cost from \$4.50 to \$1.00 per unit. The one and one half pounds less metal now needed actually produces a stronger, more rigid assembly than possible before. The entire unit is produced in the shop without waiting for outside sources. With less machining and less cleaning, fewer manhours are required to turn out a more dependable product.



# **How to Design in Steel and Cut Costs**

Lincoln design specialists throughout the country are equipped to train product designers and production engineers on how to simplify designs for low cost manufacture. Design bulletins are also available by writing on your letterhead to Dept. 1202

# THE LINCOLN ELECTRIC COMPANY

Cleveland 17, Ohio THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

# LOCKNUTS

Link-Belt Co. (For Positioning Bearings), 519 N. Holmes Ave., Indianapolis 6, Ind.

# LUBRICANTS, Including Extreme Pressure (EP) Machinery Lubricants

Cities Service Oil Co., 70 Pine St., New York, N. Y.

Cities Service Oil Co., 70 Pine St., New York, N. Y.

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.

Lubriplate Div., Fiske Bros. Refining Co., 120 Lockwood St., Newark S, N. J.

Shear-Speed Chem. Prod. Div., Michigan Tool Co., 7125 E. McNichols Rd., Detroil 12, Mich. Sinclair Refining Co., 600 5th Ave., New York, N. Y.

Standard Oill. Co. (Indiana), 910 S. Michigan, Chicago, Ill.

Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.

Sun Oil Co., 1608 Walnut St., Philadelphia, Pa. Texas Co., 135 E. 42nd St., New York, N. Y.

#### LUBRICATING SYSTEMS

Farvel Corp., 3249 E. 80th St., Cleveland, Ohio. Madison-Kipp Corp., Madison, Wis. Norgren, C. A., Co., Inc., 3419 S. Elati St., Englewood, Colo.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago III. Chicago, III.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.

# MACHINE KEYS

Gillen, John, Co., Inc., 2540 S. 50th Ave., Cicero 50, III.

# MACHINE PARTS, Special

Gillen, John, Co., Inc., 2540 S. 50th Ave., Cicero 50, III.

# MACHINISTS' SMALL TOOLS

e Calipers, Hammers, Drills, Taps, Etc. Wrenches.

# MANDRELS

See Arbors and Mandrels.

# MARKING MACHINES AND DEVICES

Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit, Mich.

# MASKS, Painting

Conforming Matrix Corp., 342 Toledo Factories Bldg., Toledo 2, Ohio.

# MEASURING MACHINES AND INSTRUMENTS, Precision Cleveland Instrument Co., 735 Carnegie Ave.,

Cleveland Instrument Co., 135 Cathaga. Cleveland 15, Ohio. Crone Parking Co., 1800 Cuyler Ave., Chicago. DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Federal Products Corp., P.O. Box 1027, Provi-dence, R. I. Lutkin Rule Co., Hess Ave., Saginaw, Mich. Norma-Hoffman Bearings Corp., Stamford,

Conn.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Waltham St., Watertown,
Boston, Mass.

# MEASURING WIRES, THREAD, SPLINE AND GEAR

Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass. Taft-Peirce Mfg. Co., Woonsocket, R. I.

METAL, Bearings See Bearings, Bronze, Babbitt, Etc., and Bushings, Brass, Bronze, Etc.

# METERS

See Recording instruments.

#### MICROMETERS

Alina Corp., 401 Broadway, New York 13, N. Y. Ames, B. C., Co. (Dial), Waltham 54, Mass. Brown & Sharpe Mfg. Co., Providence, R. I. DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Lufkin Rule Co., Hess Ave., Saginaw, Mich. Millers Falls Co., Greenfield, Mass. Pratt & Whitney, West Hartford 1, Conn. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y. Starrett, The L. S., Co., Athol, Mass. Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

# MICROSCOPES, Toolmakers

DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

# MILLING ATTACHMENTS

Brown & Sharpe Mfg. Co., Providence, R. I. Cincinnati Milling Machine Co., Cincinnati Consolidated Machine Tool Corp., Rochester,

Consolidated Machine Tool Corp., Rochester, N. Y.
Fray Machine Tool Co., 515 W. Windsor Rd., Glendale 4, Calif.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

# MILLING AND CENTERING MACHINES

Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis. Halpern, Wm., Co., Inc., 100 Stevens Ave., Mt. Vernon, N. Y. Jones & Lamson Mch. Co. (Automatic), 160 Clinton St., Springfield, Vt. Sundstrand Mch. Tool Co., 2531 11th St., Rock-ford, III.

# MILLING MACHINES, Automatic

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich. Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Kearney & Trecker Corp., Milwaukee, Wis.
Peerless Production Corp., 19449 Glendale Ave., Detroir 23, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroir 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S., Tool Co., Inc., 255 North 18th St., Ampere, N. J. Cincinnati Milling Machine Co., Cincinnati,

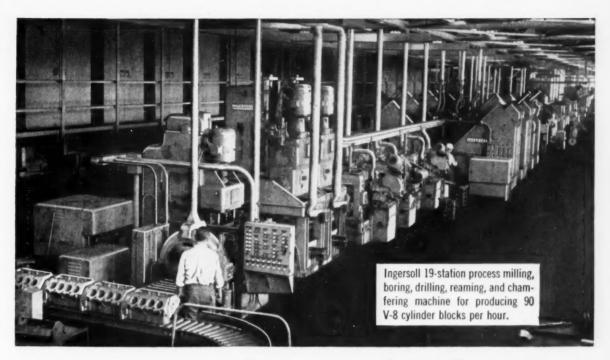
# MILLING MACHINES, Bench

Barker Engrg. Co., 500 Green Rd., Cleveland 21 Ohio. Hardinge Bros., Inc. (Bench or Pedestal Type), 1418 College Ave., Elmira, N. Y. Pratt & Whitney, West Hartford 1, Conn.

# MILLING MACHINES, Circular

Continuous Continuous

Consolidated Machine Tool Corp., Rochester, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis., Espen-Lucas Mch. Works, Front St. and Girard Ave., Phiadelphia, Pa., Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis., Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill., Rockford, Ill. (Continued on page 404)



# uses VICKERS hydraulics

One operator controls this entire machine in which a total of 20 milling, 18 boring, 16 chamfering and 4 drilling spindles are at work simultaneously. A hydraulic transfer mechanism moves the V-8 engine blocks automatically from station to station . . . turning them as needed . . . clamping and unclamping. Feeding of the tools is also "done hydraulically. The entire operation is controlled by electro-hydraulic circuits from the loading station.

Vickers Hydraulics was used throughout by The Ingersoll Milling Machine Company. Among the advantages gained by using Vickers Hydraulics are: (1) simplification of design, (2) flexibility of control, (3) instantaneous response, (4) ease of providing interlocks and overload protection, (5) low maintenance with minimum down time.

The Vickers Application Engineer near you will gladly supply any additional information you may desire regarding the many benefits to be gained by using Vickers Hydraulics.

# **VICKERS** Incorporated

DIVISION OF THE SPERRY CORPORATION

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Single Stage Balanced Vane Type Pump



Double and Two-Pressure Balanced Vane Pumps



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Traverse and Feed Cycle Control Panel



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6684

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921



Maxwell E-Z Set Boring Tools can be set for cuts in approximately 1/10th the time formerly required by similar tools! This is made possible by precision calibrations on the micrometer-like dial, which also provides boring accuracy to within 0.0002-inch.

Maximum safety of operation and ease of handling is assured by smooth circular shape. Interchangeable shanks facilitate use of E-Z Set Boring Tools in turret lathe, jig bore, milling machine, boring mill, automatic or other machine tools. Three models are available having maximum boring bar capacities of 1/2, 1 and 11/2 inches, and covering a boring range from 36 to 20 inches.

Specify Maxwell E-Z Set Boring Tools for accurate, high speed production boring.

WRITE TODAY FOR E.Z SET

# THE MAXWELL COMPANY

420 Broadway . Bedford, Ohio 404—MACHINERY, April, 1954

# MILLING MACHINES, Duplex

Cincinnati Milling Machine Co., Cincinnati, Consolidated Machine Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, III.
Kearney & Trecker Corp., Milwaukee, Wis.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J. solidated Machine Tool Corp., Rochester,

# MILLING MACHINES, Hand

Barker Engrg. Co., 500 Green Rd., Cleveland 21, Ohio. 21, Ohio.
Frew Macthine Co., 121 East Luray St., Philadelphia 20, Pa.
Nichols-Morris Corp., 76 Mamaroneck Ave.,
White Plains, N. Y.
U. S. Tool Co., Inc., 255 North 18th St.,
Ampere, N. J.
Van Norman Co., 3640 Main St., Springfield 7,

# MILLING MACHINES, Horizontal, Plain

and Universal

Austin Industrial Corp., 76 Mamaroneck Ave.,
White Plains, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati,
Obio Ohio.
Consolidated Machine Tool Corp., Rochester, Onio.
Onio.
Onio.
Onio.
Onsolidated Machine Tool Corp., Rochester,
N. Y.
Cosa Corp., 405 Lexington Ave., New York 17.
Fray Machine Tool Co., 151 W. Windsor Rd.,
Glendole 4, Calif.
Gorton, Geo., Mch. Co., 1110 W. 13th St.,
Racine Wis.
Greaves Mch. Tool Co., 2009 Eastern Ave.,
Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St.,
Rockford, Ill..
Rearney & Treeker Corp., Milwaukee, Wis.
Kempsmith Machine Co., 1819 S. 71st. St.,
Milwaukee 14, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St., New
York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sheldon Machine Co., Inc., 4240-4258 N. Knox
Ave., Chicago 41, Ill.
Simmons Mch. Tool Corp., 1600 N. Broadway,
Albany, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich. Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y. Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III. Van Norman Co., 3640 Main St., Springfield 7, Mass.

# MILLING MACHINES, Lincoln Type

Brown & Sharpe Mfg. Co., Providence, R. I. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III.

# MILLING MACHINES, Planer Type

MILLING MACHINES, Planer Type
Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St. and Girard
Ave., Philadelphia, Pa.
Giddings & Lewis Machine Tool Co., Fond du
Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn.
R. R. Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St.,
Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Pratt & Whitney, West Hartford 1, Conn.

# MILLING MACHINES, Profile

Cincinnati Milling Machine Co., Cincinnati, Cosa Corp., 405 Lexington Ave., New York 17, N. Y. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit Ex. Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N.Y.
Prott & Whitney, West Hartford 1, Conn.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III.

# MILLING MACHINES, Rom Type Universal

Fray Machine Tool Co., 515 W. Windsor Rd., Glendale 4, Calif. Van Norman Co., 3640 Main St., Springfield 7, Mass.

# MILLING MACHINES, Turret Type

Bridgeport Machines, Inc., Linley Ave., Bridge-port, Conn.

# MILLING MACHINES, Vertical

Brown & Sharpe Mfg. Co., Providence, R. I. Cincinnati Milling Machine Co., Cincinnati, Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y. Ekstrom, Carlson & Co., 1437 Railroad Ave., Rockford, Ill.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford I, Conn.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

# MODEL AND EXPERIMENTAL WORK

See Special Machinery and Tools,

# MOLD AND DIE COPYING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17. Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis. Pratt & Whitney, West Hartford 1, Conn. Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

# MOLDING MACHINES, Plastic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio. annifin Corp., 1101 S. Kilbourn Ave., Chicago, IIII.
Hydraulic Press Mfg. Co., 300 Lincoln Ave.,
Mt. Gilead, Ohio.
Rockford Machine Tool Co., 2500 Kiswaukee
St., Rockford, III.
Watson-Stillman Co., Div., H. K. Porter Co.,
Inc., Roselle, N. J.

# MOTORS, Electric

Delco Products Div., General Motors Corp., 321 E. First St., Dayton, Ohio. General Electric Co., Schenectady, N. Y. Howell Electric Motor Co., Howell, Mich. Reliance Electric & Engra. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.

# MOTORS, Hydraulic

Gerotor May Corp., Oliver St. and Maryland Ave., Baltimore, Md. Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis. Sundstrand Machine Tool Co., 2531 11th St., Rockford, III.

# MULTIPLE-SLIDE FORMING MACHINES

Nilson Machine Co., A. H., 1506 Railroad Ave., Bridgeport, Conn. U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

# NIBBLING MACHINES

Campbell Machine Div., American Chain & Cable Co., Inc., 929 Connecticut Ave., Bridgeport, Conn.

# NIBBLING MACHINES, Nickel

International Nickel Co., Inc., 67 Wall St., New York, N. Y. Wales-Strippet Corp., N. Tonawanda, N. Y.

# NIPPLE THREADING MACHINERY

Landis Machine Co., Inc., Waynesboro, Pa.

# **NUT MAKING MACHINERY**

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohlo.

(Continued on page 408)

For more Information on products advertised, use Inquiry Card, page 261



The Small Arms Industry requires a soft, absorbent wiper that can pick up metal chips and then be thrown away—so that carefully machined parts will not be scratched. Scott Wipers are the answer.



The Candy Industry, in particular, needs a clean, safe wiper. Scott Wipers are a natural for bakeries, dairies—any place where cleanliness is a must. Women employees, especially, like these wipers.



The Electrical Equipment Industry must have a versatile wiper. From dusting to cleaning-away heavy grease, Scott Industrial Wipers are equally adaptable for huge armatures or fragile condensers.

# To meet a human need...

Scott Industrial Wipers bring a new standard of safety and efficiency to Industrial Wiping



For more information on products advertised, use Inquiry Card, page 261

Today, all over the country, more and more companies are changing to this entirely different wiping material, the Scott Industrial Wiper.

Scott Wipers now make wiping a scientific step in production—measurable in terms of cost, safety and efficiency.

Wherever you use wiping materials now, try Scott Industrial Wipers. See if they don't do a better job. And they're excellent for wiping hands and face.

Most firms have found an on-the-job pilot installation to be the best way of proving the merits of Scott Industrial Wipers. A Scott man stands ready to demonstrate this in your plant.

Simply mail this coupon or call your local Scott distributor.

SCOTT PAPER	COMPANY
Dept. M.F. Ches	ter, Pa.
	ull information on
Scott Industrial V	Vipers
Name	
Company	
Address	
City	State

MACHINERY, April, 1954-405

# How Do You Buy Socket Screws?

Many buyers continue to specify some one make by *habit*. They have no particular preference for it, but they think of *all* such fasteners simply as "screws with hex sockets" — *all* makes substantially *alike*.

If you buy that way, and have never tried P-K Socket Screws, just break the habit once, and give them an actual assembly test. You'll get a pleasant surprise.

You'll find that the hex shape of the socket is about the only way that other makes and P-K are "alike".

# Beyond the Hex

It pays to *look beyond the socket* when you buy Socket Screws. Compare every detail of product and service. You'll find P-K Socket Screws take top rating in every test. You get exclusive features that simplify and speed up assembly. You get quality matched to a firm guarantee. You get planning and buying information exactly patterned to your needs.

You need *all* these essentials for cost-wise assembly. Why miss out on *any* of them? Just try P-K Socket Screws. Get samples from your P-K Distributor, or write: Parker-Kalon Division, General American Transportation Corporation, 202 Varick St., New York 14.

# for all the essentials of cost-wise assembly



IN STOCK

for immediate delivery — see the nearby P-K Socket Screw Distributor —





# In Socket Set Screws PARKER-KALON gives you

- GROUND THREADS at no extra cost. Gage-like precision, mirror-smooth finish uniform, dependable Class 3 tolerance. Mechanics like their easy starting, easy keying.
- PROVED ASSEMBLY STRENGTH The "proving ground" is the millions of assemblies made by thousands of satisfied users of P-K Socket Screws, whose products are used everywhere, many under the taughest conditions of vibration.

# In Socket Cap Screws PARKER-KALON gives you

- SIZE-MARK offered only by P.K. Incised on the head
  of each screw, it saves time and wasted screws when sizes
  get mixed up, prevents errors by green help. Maintenance
  and service men like Size-mark, it helps in reassembling.
- GEAR GRIP Meshing firmly with finger tips, it prevents slipping and fumbling when hands are oily, speeds starting.
- MAXIMUM STRENGTH Head, socket, and threads are accurately formed by Parker-Kalon's cold-pressure process. Steel structure "flows" to conform to all contours, assures maximum strength at points of greatest stress.

# In all Socket Screws PARKER-KALON gives you

- GUARANTEED FIRST QUALITY Based on tests and inspections at every step in production — an exacting routine of quality control supervised by P-K laboratory Technicians.
- FULL RANGE OF STYLES AND SIZES You'll find any Socket Screw you need, NC or NF, in P-K's complete line, and Hex Keys in all sizes, and in several handy sets. Ask your P-K Distributor for the P-K Price List, Catalog, any information you need. Slide chart Socket Screw Dimension Finder Free.













your local Supply and Service Specialist



COMPETITIVELY PRICED

For safety, Victor High Speed Flexible Blades are shatterproof. And, like all Victor Blades, they are made by exclusive processes, with special machinery, to unequalled quality standards, and remember, no premium price.

Your Victor distributor is the man to call, for Victor Hack Saw Blades and for the other tools and supplies he carries. We have selected him with care - for complete inventories, swift deliveries, helpful service, and quality products.

Sold Only Through Recognised Distributors B 2230



SAW WORKS, INC. - MIDDLETOWN, N.Y., U.S.A Makers of Hand and Power Hack Saw Blades; Frames; Metal & Wood Cutting Band Saw Blades.

408-MACHINERY, April, 1954

# **NUT SETTING EQUIPMENT**

See Screw Driving and Nut Setting Equipment.

#### **NUT TAPPERS**

See Bolt and Nut Machinery,

# NUTS, Cold Forged, Wing and Cap

Chicago Screw Co., Bellwood, III.
Parker-Kalon Div., General American Transportation Corp., 200 Varick St., New York, N. Y.
Republic Steel Corp., (Union Drawn Steel Div.),
Republic Bidg., Cleveland I, Ohio.
Union Drawn Steel Co., Div., Republic Steel
Corp., Massillon, Ohio.

# **NUTS, Self-locking**

Grip Nut Co., 310 S. Michigan Ave., Chicago 4,

NUTS, Thumb or Wing and Cap
Allmetal Screw Products Co., Inc., 821 Stewart
Ave., Garden City, N. Y. (Stainless Steel only)
Northwestern Tool & Engrg. Co., 117 Hollier,
Dayton, Ohio.
Republic Steel Corp., Bolt and Nut Div., Republic Bldg., Cleveland 1, Ohio.
Williams, J. H. & Co., 400 Vulcan St., Buffalo
7, N. Y.

# OIL CUPS

Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, III.

# OIL EXTRACTORS AND CLEANERS

De Laval Separator Co., Poughkeepsie, N. Y.

# OIL GROOVERS

Wicaco Machine Co., Stenton Ave. and Louden St., Philadelphia, Pa.

# **OIL-HOLE COVERS**

Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, III.

# OIL SEALS

Crane Packing Co., 1800 Cuyler Ave., Chicago, Garlock Packing Co., Palmyra, N. Y.

# **OILERS AND LUBRICATORS**

Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, III. Madison-Kipp Corp., Madison, Wis. Norgren, C. A., Co., Inc., 3419 S. Elati St., Englewood, Colo.

# OILS, Cutting

See Cuiting and Grinding Fluids.

# OILS, Lubricating

Cities Service Oil Co., 70 Pine St., New York, N. Y. N. T. Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa. Sinclair Refining Co., 600 5th Ave., New York Standard Oil Co., (Indiana), 910 S. Michigan, Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, III. Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, II. Sun Oil Co., 1608 Walnut St., Philadelphia, Pa. Texas Co., 135 E. 42nd St., New York, N. Y.

# OILS, Quenching and Tempering

Cities Service Oil Co., 70 Pine St., New York, N. Y. Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa. Sinclair Refining Co., 600 5th Ave., New York. Tork. Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, III. Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, III.

# OILS. Soluble

ee Compounds, Cutting, Grinding, Metal Drawing, Etc.

# OPTICAL FLATS

Crane Packing Co., 1800 Cuyler Ave., Chicago. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

# ORDNANCE MACHINES, Spelial

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Rehnberg-Jacobson Mfg. Co.. 2135 Kiswaukee
St., Rockford, III.
Peerless Production Corp., 19449 Glendale
Ave., Detroit 23, Mich.

## PACKING, Leather, Metal, Rubber, Asbestos, Etc.

Crane Packing Co., 1800 Cuyler Ave., Chicago. Garlock Packing Co., Palmyra, N. Y. Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa. Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

# PAINTING EQUIPMENT, Spray

Lowe Bros. Co., Dayton, Ohio. Ransburg Electro-Coating Corp., 1234 Barth, Indianapolis 7, Ind.

#### PARALLELS

Brown & Sharpe Mfg. Co., Providence, R. I. Lufkin Rule Co., Hess Ave., Saginaw, Mich. Starrett, The L. S., Co., Athol, Mass. Taft-Peirce Mfg. Co., Woonsocket, R. I. Walker, O. S., Co., Inc., Worcester, Mass.

# PATTERNS, Wood and Metal

Mummert-Dixon Co., Hanover, Pa.

# PILLOW BLOCKS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass. Link-Belt Co., 519 N. Holmes Ave., Indianapo-lis 6, Ind. Norma-Hoffman Bearings Corp., Stamford, Conn. Standard Pressed Steel Co., Jenkintown, Pa.

# PIPE, BRASS AND COPPER

American Brass Co., 25 Broadway, New York, N. Y. Mueller Brass Co., Port Huron 35, Mich. Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y. Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

# PIPE STEEL

Alleghany Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Iones & Laughlin Steel Corp., Gateway Center
No. 3 Bldg., Pittsburgh, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St.,
New York 17, N. Y.
Republic Steel Corp., Republic Bldg., Cleveland
I, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th
St., Chicago 18, Ill.
United States Steel Corp., National Tube Co.,
Div., 436 7th Ave., Pittsburgh, Pa.

## PIPE THREADING AND CUTTING MACHINES

Landis Machine Co., Inc., Waynesboro, Pa.

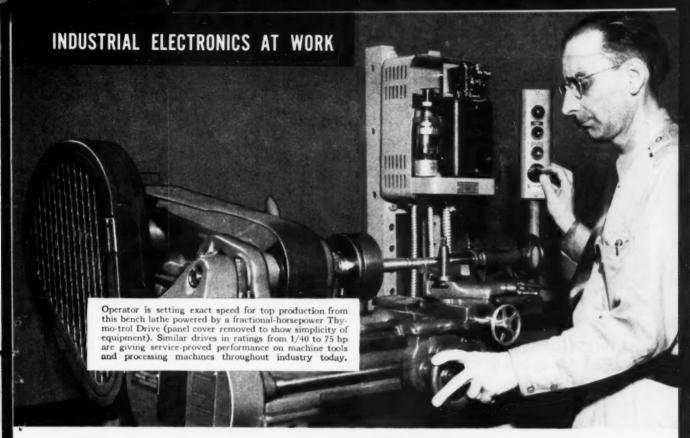
# PIPE TONGS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

# PLANER ATTACHMENTS

Consolidated Mch. Tool Corp., Rochester, N. Y. Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. Gray, G. A., Co., Woodburn Ave. and Penn R. R., Evanston, Cincinnatl, Ohio. Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio. Northwestern 1001 & Engrg. Co., 177 Finner, Dayton, Ohio.
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(Continued on page 410)

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When close speed regulation is required . . .

# General Electric THY-MO-TROL\* Drives Can Help You Cut Production Costs

**EXACTLY THE RIGHT SPEED FOR TOP PRODUCTION** is assured by the *wider speed ranges* offered by G-E Thy-mo-trol Drives... your machines are more versatile and more productive for a greater variety of jobs. Typical Thy-mo-trol Drive speed ranges are 5:1, 20:1, 50:1 and 100:1; and, if required, much higher speed ranges are possible under certain conditions.

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GREATER PROTECTION FOR DRIVE AND MACHINE is yours with all full-wave G-E Thy-mo-trol Drives because current limiting features eliminate the danger of overloading machine or drive. If the driven machine should jam, the motor will automatically stall before torque becomes excessive.

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Zagar gearless drillhead, 12", 24spindle; capacity up to 5/8" steel.

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Rotary and Section Rotary and Penn R. R., Evanston, Cincinnati, Ohio.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, III.

#### PLATE ROLLS

PLATE ROLLS

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Bethlehem Steel Co., Bethlehem, Pa.

Cleveland Punch & Shear Works Co., 3917 St.

Clair Ave, N. E., Cleveland, Ohio.

Consolidated Mch. Tool Corp., Rochester, N. Y.

Ryerson, Joseph T., & Son, Inc., 2558 W. 16th

St., Chicago 18, III.

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PLATES, Surface
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Delta Power Tool Div., Rockwell Mfg. Co.,
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DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Prott & Whitney Div., West Hartford I, Conn.
Scherr, George, Co., Inc., 200 Lafayette St.,
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Taft-Peirce Mfg. Co., Woonsocket, R. I.
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Ampere, N. J.
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28, Mich.

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Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41 III.
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Millers Falls Co., Greenfield, Mass.
Sundstrand Machine Tool Co., 2531 11th St.,
Rockford, Ill.

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Jarvis, Charles L., Co., Middletown, Conn. Sundstrand Machine Tool Co., 2531 11th St., Rockford, III.

# POWER UNITS, Hydraulic

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# PRESSES, Air

Famco Machine Co., 3134 Sheridan Rd., Ken-

# PRESSES, Arbor

Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio. Dake Engine Co., 604 Seventh St., Grand Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Famco Machine Co., 3134 Sheridan Rd., Kensah, Wis.
Farquinar, B., Div., Oliver Corp., 21 Duke St., York, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago. Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Tomkins-Johnson Co., 614 No. Mechanic St., Jackson, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.

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Ohio.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Farguhar, A. B., Div., Oliver Corp., 21 Duke Haven, Mich.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.
St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Lake Erie Engra. Co., Kenmore Station, Buffalo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Watson-Stillman Co., Div. H. K. Porter Co., Wis. Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

# PRESSES, Extrusion

PRESSES, Extrusion

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati. Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.

Chambersburg Engrg. Co., Chambersburg, Pa. Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.

Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.

Lake Erie Engrg. Co., Kenmore Station, Buffalo, N., Ygrg. Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

# PRESSES, Foot

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio. Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis. Ferracute Machine Co., Bridgeton, N. J. Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.

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Baldwin-Lima-Hamilton Corp., Lima-Hamilton
Div., Hamilton, Oho.
Bethlehem Steel Co., Bethlehm, Pa.
Biss Co., E. W., 1375 Raff Rd., S. W., Canton,
Ohio.
Clearing Machine Corp., 6499 W. 65th Co. Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, III.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven. Mich.
Frie Foundry Co., Erie, Pa.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engig. Corp., Kenmore Station, Buffolo, N. Y.
Morgan Engrg. Co., Alliance, Ohio.
National Mchry. Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, III.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

# **PRESSES Hydraulic**

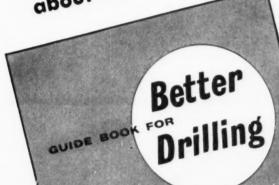
American Broach & Mch. Co., Ann Arbor, Mich. American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincin-Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, III.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton Ohio. Birdsboro Birdsboro Birdsboro Birdsboro Birdsboro Birdsboro Boro Birdsboro B Haven, Haven Brigg, Co., 1988 Page 16, Ohio. Erie Foundry Co., Erie, Pa. Fire Foundry Co., Erie, Pa. Farquhar, A. B., Div., Oliver Corp., 21 Duke St., Page 414)



Jim, what feed
and coolant
should I use for
drilling this
spring steel?

ALO owl g!

Light feed — sulphur base
oil, Bert.
booklet tells you just about
anything you want to know
about drills and drilling!





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Punching

SETUP MAN:

Say, that's something we've always needed!

FOREMAN:

Sure is, Bert. And everything's easy to find. See this table on pages 12 and 13? It lists all the materials, like your spring steel, then gives the Brinnell Hardness, speed, feed (according to size of drill), drill information and minimum size "Buffalo" Drilling Machine for each material.

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And what about tapping?

FOREMAN:

Everything's there—tap diagrams, materials chart for speed, feed and tap selection—causes of tap failure. And look at these pointers on picking the right twist drills and cutting down on drill dulling and drill breakage! It's really reliable, too, because Buffalo Forge has been making drillpresses a long, long time.

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FOREMAN:

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**BUFFALO FORGE COMPANY** 

440 Broadway

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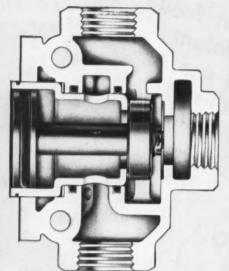
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2-Way, 3-Way and 4-Way Master Valves and solenoid Pilot-Master Valves...direct-operated 3-Way Pilot Valves in a wide choice of operating Everything you need from the simplest to the most complicated air-operated circuit can be accomplished with these valves. Included are

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# Soleneid-controlled by integral pilet heads ... P-M Pilot-Master Valves

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> spring return type; Series BB-2, Series B-2, 2-Way and 3-Way

4-Way spring return type.

2-Way and 3-Way; Series BB-1, 4-Way. For remote control from a 3-Way P-M Pilot Valve. Series B-1,

as "pilet" velves for remote central of P-M Master Valves or direct central of small cylinders. Direct-operated 3-Way ¼" (¾" tapping optional) poppet-type valves for use P-M Pilot Valves

P-M Master Valves Pressure operated



2-Way or 3-Way

2-Way or 3-Way

Models B2-37-NC and B2-37-NO

Aodel 81-37

2-Way a

2-Way or 3-Way

2-Way or 3-Way

Models 83-75-NC and 83-75-NO

Models B2-75-NC and B2-75-NO

todel 81-75

2-Way or 3-Way

Models 83-50-NC and 83-50-NO

Models B2-50-NC and B2-50-NO

todel 81-50

C8-25 Toggle Operated

CO-25 Foot

# Advantages

Springless. Replaceable without disturbing main piping. Two cartridge sizes fit lains piston-poppet. Only moving part of main valve. Removable cartridge all five valve sizes.

2-Way and 3-Way valves operate N.O. (normally open) or N.C. (normally closed). luy them either way or con-

Interchangeable: Same head fits every size valve ody in any given series. ame body fits three different vert them on the job

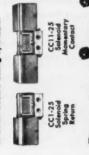
Snap action. Speeds of 600 cycles per minute entirely practical with solenoid heads in every pipe size.

• For any pressure from 15 to 150 p.s.i., gas or air. Higher pressures permissible when water or oil is the fluid.

412-Machinery, April, 1954

# P-M Direct-Operated 4-Way Valves

Direct-operated 4-Way ¼" (¾" rappi optional) poppet-type valves for cont of small double-acting cylinders.











Model 881-37





Acdel 881-50

we 3-Way Pilet-Master Valves

Model 881-75

# 2-Wey or 3-Wey

2-Way or 3-Way



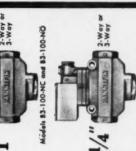
2-Way or 3-Way



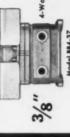


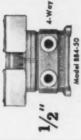






TOOL SHOW

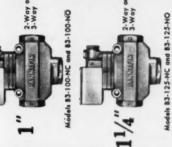


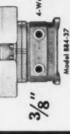














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**BOOTH 827** 

Philadelphia April 26-30





Hannifin Corporation, 1109 S. Kilbourn Ave., Chicago 24, III. • Air and Hydraulic Cylinders • Pneumatic and Hydraulic Presses • Riveters • Air Control Valves



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Morgan Engrg. Co., Alliance, Ohio.
Niagara Machine & Tool Works, 683 Northland
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Oilgear Co., 1560 W. Pierce St., Milwaukee 4,
Wis. Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20. Mich.

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Wilson, K. R., 215 Main St., Buffalo, N. Y.

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Mead Specialties Co., 4114 North Knox Ave., Chicago 41, III.

PRESSES, Screw

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Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Zeh & Hahnemann Co., 182 Vanderpool St.,
Newark, N. J.

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Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Philadelphia 42, Pa.

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton,

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg, Co., Chambersburg, Pa.
Cincinnari Shaper Co., Elam and Garrard
Aves., Cincinnati, Ohio.
Clearing Machine Corp., 6499 W. 65th St.,
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Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., 3917 St.
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Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Engine Co., 604 Seventh St., Grand
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Danly Machine Speciatives, Inc., 2107 S. 52nd
Ave., Chicago 50, Ill.
Dreis & Krump Mfc.
Co., 7416 Loomis Blvd.,
Cicago 36, Ill.
Espen-Lucas Machine Works, Front St., and
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Farquina A. B., Div., Oliver Corp., 21 Duke St.,
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Famco Machine Co., 3134 Sheridan Rd., Kensasha, Wis.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
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L. & J. Press Corp., Elkhart, Ind.
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Wales-Strippit Corp., N. Tonawanda, N. Y.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Vilson, K. R., 215 Main St., Buffalo, N. Y.
Zeh & Hahnemann Co., 182 Vanderopol St., Newark, N. J.

PRESSES, Straightening

PRESSES, Straightening
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Anderson Bros., Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y. Dake Engine Co., 604 Seventh St., Grand Hayen, Mich.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.

Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, III. cago, III.
Hydraulic Press Mfg. Co., 300 Lincoln Ave.,
Mt. Gilead, Ohio.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Machine & Tool Works, (Hydraulic)
683 Northland Ave., Buffalo, N. Y.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4,
Wis. Wis. Springfield Mch. Tool Co., Springfield, Ohio. Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J. Wilson, K. R., 215 Main St., Buffalo, N. Y.

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PULLEYS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

PULLEYS, Friction Clutch

Brown & Sharpe Mfg. Co., Providence, R. I.

PUMPS, Coolant, Lubricant and Oil

Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mfg. Co., 620
E. Vienna Ave., Milwaukee, Wis.
Ingersoll-Rand Co., Phillipsburg, N. J.
Logansport Machine Co., Inc., 810 Center Ave., Logansport Machine Co., Inc., and Center Are, Logansport, Ind. Ruthman Machinery Co., 1809 Reading Rd., Cincinnati 12, Ohio. Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J. South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind. Tompkins-Johnson Co., Jackson, Mich. Vickers, Inc., 1402 Oakman Blvd., Detroit, Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Hydraulic

PUMPS, Hydraulic
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engrg. Co., Chambersburg, Pa.
Denison Engrg. Co., 1160 Dublin St., Columbus. 16, Ohio.
Gerotor May Corp., Oliver St. and Maryland Ave., Baltimore, Md.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Ingersoll-Rand Co., Phillipsburg, N. J.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mas.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blyd., North Bergen, N. J.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

1402 Oakman Blvd., Detroit,

Mich.
Viking Pump Co., Cedar Falls, Iowa.
Vinco Corp., 9113 Schaefer Highway, Detroit
28, Mich.
Watson-Stillman Co., Div. H. K. Porter Co.,
Inc., Roselle, N. J.

**PUMPS, Pneumatic** 

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J. Thor Power Tool Co., Aurora, III. (Continued on page 416)



# JUST A TWIST OF THE Wrist

That's all it takes to clean the Cuno AUTO-KLEAN—the strainer that can be continuously cleaned while it's

Turning the handle one revolution moves the strainer element through comb blades, removing all dirt from strainer surfaces. Dirt particles fall to bottom of housing, where they can be drained off periodically. Cuno's exclusive combing operation cleans thoroughly-without costly interruption of fluid flow.

- AUTO-KLEAN's permanent metal filter element is available in steel, brass or stainless steel for long troublefree service under any conditions.
- AUTO-KLEAN is adaptable to any fluid-flow system.
- From acids to tar . . . if you can pump it, Cuno can filter it. Capacities range from one gallon per hour to 3,800 gallons per minute. A 3 B

# ENGINEERED FILTRATION

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Removes More Sizes of Solids

# HERE'S HOW TO GET LOW-COST FILTRATION OF INDUSTRIAL FLUIDS

Continuously cleanable AUTO-KLEAN eliminates need for stand-by strainers

You don't need to use a duplex strainer system to get the solids out of your coolants, chemicals, water, lube oils or hydraulic fluids. Chances are a single Cuno AUTO-KLEAN strainer will do the job.

This is possible because you don't have to shut down your fluid-flow system to clean this strainer. Cuno's exclusive "combclean" action provides complete cleaning of the strainer element on the job-without stopping fluid flow. Thus you get non-stop filtration, with no need for a stand-by strainer.

AUTO-KLEAN saves on maintenance bills, for it isn't necessary to disassemble the filter in order to clean the cartridge. An occasional rotation of the handle does a thorough cleaning job. (Most units can be equipped with motordrives for continuous cleaning.)

AUTO-KLEAN's low pressure drop permits full-flow service on gravity or low pressure lines, with no loss in operating efficiency.

AUTO-KLEAN's fixed-space metal discs will stop all solids larger than the specified disc spacingfrom .0035" (170 mesh) to .062" (12 mesh).

Send coupon today for free AUTO-KLEAN bulletin.

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**PUMPS**, Rotary

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# PUNCHES AND DIES

See Dies, Sheet Metal, Etc.

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Wales-Strippt Corp., N. Tonawanda, N. Y.
Watson-Stillman Co., Div. H. K. Porter Co.,
Inc., Roselle, N. J.
Linc., Roselle, N. J.
Wiedemann Machine Co., 4272 Wissahickon
Ave., Philadelphia, Pa.

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III.
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Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Massachusetts Gear & Tool Co., 36 Nassau St., Woburn, Mass.
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Woburn, Month, M

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Lipe-Rollway Corp., 806 Fmerson Ave. Syra Mich. ollway Corp., 806 Emerson Ave., Syra-ky Tool Corp., 1938 Thomas St., Meadcuse, N. Y.
McCosky Tool Corp., 1938 Thomas St., Mead-ville, Pa.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, 111.
Warner & Swasey Co., 8701 Carnegie Ave., Cleveland 3, Ohio.

Atrax Co., Newington, Conn.
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Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
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Ontario St., Chicago, III.
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Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich. Atrax Co., Newington, Conn. Barber-Colman Co., Rock and Montague, Rock-

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Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N.Y.

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Bros. Co., Rochester, Mich.
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Mich.
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Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd.,
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Willey's Carbide Tool Co., 1340 W. Vernor
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Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
McCrosky Tool Corp., 1938 Thomas St., Meadwille, Pa.
Prott & Whitney, West Hartford 1, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

REAMERS, Taper Pin

REAMERS, Taper Pin

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Line, Vt.
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Oakite Products, Inc., 19 Rector St., New York, N. Y. (Continued on page 418)

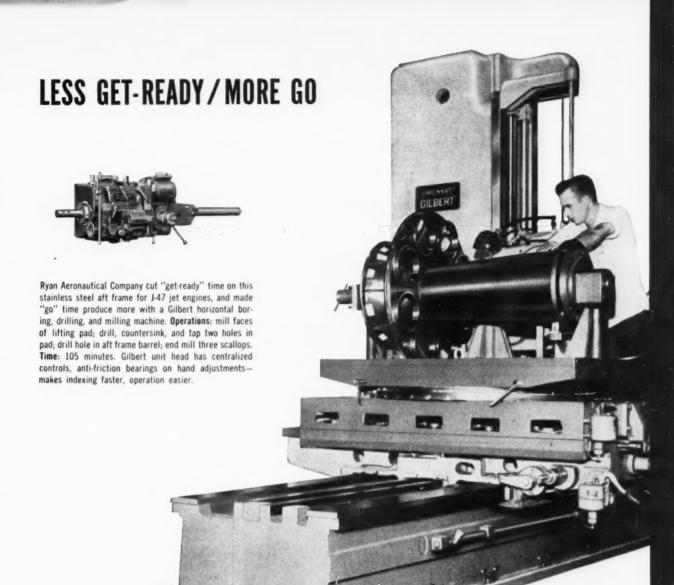


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See Blast Cleaning Equipment

# SANDERS

SANDERS

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Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Grob Bros., Grafton, Wis.
Ryerson Joseph T., & Sor, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Tannewitz Works, 315 Front St., N. W., Grand Rapids 2, Mich.
Wolker-Turner Div. Kearney & Trecker Corp. Rapids 2, Mich. Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.

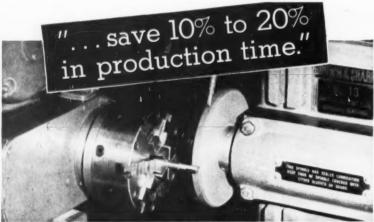
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III.
Johnson Mfg. Co., Albion, Mich.
Espen-Lucas Machine Works, Front St. and
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Only universal scrall chuck rith .0005" precision - for other, grinders, dividing heads, trew machines.

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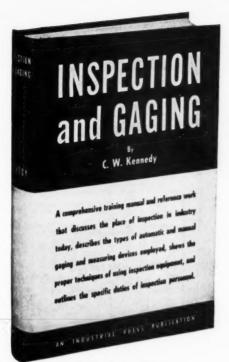
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- 2 How Specifications Aid the Inspector
- 3 Tolerances and Allowances
- 4 How Standards Aid the Inspector
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- 6 Fixed Gages
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- 8 Mechanical Indicating Equipment
- 9 Electrical and Air Indicating Equip-
- 10 Optical Measuring and Inspection Equipment
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- 12 Special Measuring and Inspection Problems
- 13 Gage Checking and Calibration
- 14 100 Per Cent Inspections
- 15 Quality Control and Sampling
- 16 Process Inspections
- 17 Hints on Making a Good Job Better

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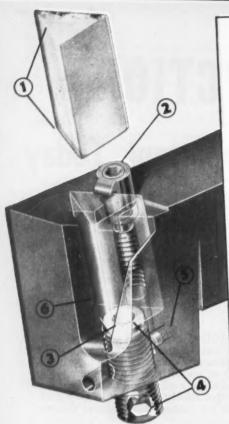
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- Indexable Kennametal" insert, preground on both ends-provides six or more cutting edges (depending on style) before sharpening is required.
- Rugged clamp and screw is interchangeable on all standard Kennamatic styles and sizes.
- Hollow back-up screw facilitates removal of snug-fitting (frozen) insert.
- Hex sockets on both ends of back-up screw for quick adjustment or changing of insert, from either top or bottom.
- Nylon plug, and spring, for friction locking of back-up screw.
- Ample clearance at front of holder eliminates shank abrasion from "chip wash." (6)

# For Getting Jobs Done FAST!

Kennamatic\* features help get the most out of a machine because there's far less downtime for tool changing when you put these multiple-edge, indexable insert tools to work. For example:

Conventional brazed carbide tools, used to rough turn SAE 1140 sleeve yokes, machined only 100 to 125 pieces per grind, and 1000 to 1250 per tool life.

Kennamazic tools were put on the job. Operating conditions and machining time remained the same, BUT-9 times as many pieces are now turned per tool grind, and 10½ times as many per tool life.

Tool cost is now only one-sixth of the former amount—and production is higher because of less downtime.

Kennamatic inserts have Kennametal's high hardness and wearresistance for long life. Clamped-in, they can be indexed in seconds to new cutting positions without removing or resetting the tool . . . a great time-saving feature. After all cutting edges at both ends of an insert have been used, they are resharpened by squaring off the ends and grinding chip breaker, if desired-no precise angles to form; no steel to grind.

Only Kennametal makes Kennamatics. Ask your nearest Kennametal tool representative to help you apply this cost-saving tooling to your production or job lot operation. Kennametal Inc., Latrobe, Pa.

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Tannewitz Works, 315 Front St., N. W., Grand Rapids 2, Mich.
Union Twist Drill Co., Athol, Mass.
Wolker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

SAWS, Metal Cutting Band

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DoAll Co., 254 Laurel Ave., Des Plaines,

III.
Johnson Mfg. Co., Albian, Mich.
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St., Chicago 18, III.
Simonds Saw & Steel Co., 470 Main St., Fitch-

Simonds Saw & Steel Co., 470 Maint St., Starburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Tannewitz Works, 315 Front St., N. W., Grand Rapids 2, Mich.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

SAWS, Portable Electric

Back & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Millers Falls Co., Greenfield, Ohio.

SAWS, Screw Slotting

Barber-Colman Co., Rock and Montague, Rocktard, III.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gorham Tool Co., 14400 Woodrow Wilson,
Detroit, Mich.
National Twist Drill & Tool Co., & Winter Bros.
Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Union Twist Drill Co., Athol, Mass.

SCRAPERS, Hand and Power

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, III.

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Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J. Keller Tool Co., Grand Haven, Mich.

# SCREW DRIVING AND NUT SETTING EQUIPMENT

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md. Errington Mechanical Laboratory, Inc., 24 Nor-wood Ave., Stapleton, S. J., N. Y. Ingersoll-Rand Co., Phillipsburg, N. J. Jarvis, Charles L. Co., Middletown, Conn. Keller Tool Co., Grand Haven, Mich. Ther Power Tool Co., Aurora, III.

# SCREW MACHINE TOOLS AND EQUIPMENT

AND EQUIPMENT

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Colonial Broach Co., P. O. Box 37, Harper Sta.,
Detroit 13, Mich.
Gisholt Machine Co., 1245 E. Washington Ave.,
Madison 10, Wis.
Gorham Tool Co., 14400 Woodrow Wilson,
Detroit, Mich.
Greenlee Bros. & Co., 12th and Columbia
Aves., Rockford, Ill.
Millers Falls Co., Greenfield, Mass.
National Acme Co., 170 E. 131st St., Cleveland.
New Britain Mch. Co., New Britain-Gridley
Mch. Div., New Britain, Conn.
Potter & Johnston Co., 1027 Newport Ave.,
Powtucket, R. I.
R and L Tools, 1825 Bristol St., Philadelphia
40, Pa.
Reed Rolled Thread Die Co., P. O. Box 350,
Worcester I, Mass.
Warner & Swasey Co., 5701 Carnegie Ave.,
Cleveland 3, Ohio.
(Continued on page 422)

(Continued on page 422)

**HOW KENNAMATIC\* WORKS** 

1 Kennamatic\* insert round, square, triangular, or diamond shaped—is precision ground. It is placed in holder, adjusted to cutting position with back-up screw: locked into place by tightening clamp nut.



When one edge of insert becomes worn, clamp is released, to new cutting position. When all cutting edges of both ends have been easily reground.

2



Worn inserts are sharpened simply by facing off both ends

Back-up screw is adjusted (from either top or bottom) to bring cutting point to center.

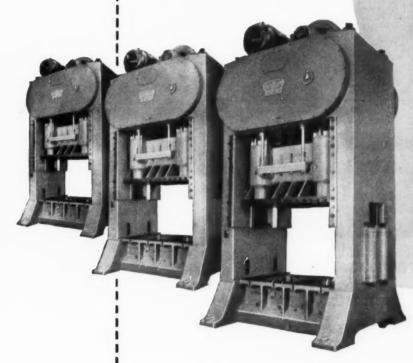


\*Registered Trade-Marks



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The trouble-free Cleveland Drum Type Clutch gives you positive, instantaneous slide control. Its greater accuracy means fewer rejects. Lightweight and easy to maintain, it cuts press operating costs.

Make your new presses
Clevelands. A Cleveland
engineer will gladly help you
choose the right model
Clevelands for economical
press production.

Cleveland 4 Point Presses equipped with Cleveland (Patented) Drum Type Clutch



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CITY FOUNDRY DIVISION - SMALL TOOL DEPARTMENT



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MACHINERY, April, 1954-421

# SCREW MACHINE WORK

Eastern Mch. Screw Corp., New Haven, Conn. Mueller Brass Co., Port Huron 35, Mich. National Acme Co., 170 E. 131st St., Cleve-

land. Ottemiller, W. H., Co., York, Pa. Standard Pressed Steel Co., Jenkintown, Pa. Wicaco Machine Corp., Stenton Ave., and Louden St., Philadelphia, Pa.

# SCREW MACHINES, Automotic Single and Multiple Spindle

Single and Multiple Spindle
Brown & Sharpe Mfg. Co., Providence, R. I.
Cone Automatic Mch. Co., Inc., Windsor, Vt.
Cosa Corp., 405 Lexington Ave., New York 17,
N. Y.
Gorton, George, Mch. Co., 1110 W. 13th St.,
Racine, Wis.
Greenlee Bros. & Co., 12th and Columbia
Aves., Rockford, III.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley
Mch. Div., New Britain, Conn
Orban, Kurf. Co., Inc., 205 East 42nd St.,
New York 17, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave.,
Cleveland 3, Ohio.

# SCREW MACHINES, Hand

See also Lathes, Turret
Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. 1.
Gisholt Machine Co., 1245 E. Washington Ave.,
Madison 10, Wis.
Hardinge Bros., Inc., 1418 College Ave., Elmira,
N. Y.
Orban. Kurt. Co., 122, 122

Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y. Rivett Lathe & Grinder, Inc., Brighton, Boston

New York 17, 18 New York 17, 18 New York 17, 18 New York 17, 18 New York 18, 1

SCREW PLATES

Butterfield Div., Union Twist Drill Co., Derby Line, Vt. Card, S. W., Mtg. Co., Div. Union Twist Drill Co., Mansfield, Mass. Greenfield Top & Die Corp., Greenfield, Mass. Pratt & Whitney, West Hartford 1, Conn. Winter Bros. Co., Rochester, Mich.

# SCREWS, Cap, Set, Safety Set and Machine, Etc.

Allen Mfg. Co., 133 Sheldon St., Hartford 2,

Conn.
Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.

23, Mich.
Alimetal Screw Products Co., Inc., 821 Stewart
Ave., Garden City, N. Y. (Stainless Steel
only.)
Chicago Screw Co., Bellwood, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Ottemiller, W. H., Co., York, Pa.
Parker-Kalon Div., General American Transportation Corp., 200 Varick St., New York,
N. Y.

N. Y.
Republic Steel Corp., Bolt & Nut Div., Republic
Bldg., Cleveland I, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., 100
Midland Ave., Port Chester, N. Y.
Standard Pressed Steel Co., Jenkintown, Pa.

# SCREWS, Self-tapping, Drive

Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only.) Parker-Kalon Div., General American Trans-portation Corp., 200 Varick St., New York, N. Y.

SCREWS, Thumb

Ilmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only.) Northwestern Tool & Engrg. Co., 117 Hollier,

Northwestern Tool & Carly Dayton, Ohio.
Parker-Kalon Div., General American Transportation Corp., 200 Varick St., New York,

Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

# SEALS AND RETAINERS, Oil or Grease

Crane Packing Co., 1800 Cuyler Ave., Chicago, III.

III. Garlock Packing Co., Palmyra, N. Y. Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, III.

# SECOND-HAND MACHINERY, Etc.

Eastern Machinery Co., 1006 Tennessee Ave., Cincinnati 22, Ohio. Miles Machinery Co., Box 770 Saginaw, Mich. Morey Machry, Co., Inc., 410 Broome St., New York, N. Y. Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.

# SEPARATORS, Centrifugal

De Laval Separator Co., Poughkeepsie, N. Y. The Sharples Corp., 2300 Westmoreland St., Philadelphia 40, Pa.

# SEPARATORS, Oil or Coolant

Barnes Drill Co. (Magnetic), 814 Chestnut, Rockford, III. National Acme Co., 170 E. 131st St., Cleveland, Notional Acme Co., 170 E. 19191 July Ohio. The Sharples Corp., 2300 Westmoreland St., Philadelphia 40, Pa.

# SHAFTING, Steel

BAHAFTING, Steel

Bethlehem Steel Co., Bethlehem, Pa.
Cumberland Steel Co., Cumberland, Md.
De Laval Separator Co., Poughkeepsie, N. Y.
Jones & Laughlin Steel Corp., Gateway Center
No. 3 Bldg., Pittsburgh, Pa.
Läsalle Steel Co., Hammond, Ind.
Republic Steel Corp., Union Drawn Steel Div.,
Republic Bldg. Cleveland 1 Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, Ill.
Summerill Tubing Co., Div. Columbia Steel &
Shafting Co., P.O. Box 1557 Pittsburgh, 30,
Pa.

National Forge & Ordnance Co., Irvine, Warren County, Pa. Standard Pressed Steel Co., Jenkintown, Pa. Summerill Tubing Co., Div., Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.

# SHAFTS, Flexible

Jarvis, Chas. L., Co., Middletown, Conn.

SHAFTS, Hollow-Bored Bethlehem Steel Co., Bethlehem, Pa.

# SHAFTS, Turned and Ground

SHAFTS, Turned and Ground
Bethlehem Steel Co., Bethlehem, Pa.
Cumberland Steel Co., Cumberland, Md.
Jones & Laughlin Steel Corp., Gateway Center
No. 3 Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
National Forge & Ordnance Co., Irvine, Warren
County, Pa.
Republic Steel Corp., Union Drawn Steel Div.,
Republic Steel Corp., Union Drawn Steel Div.,
Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, Ill.
Summerill Tubing Co., Div. Columbia Steel &
Shafting Co., P.O. Box 1557, Pittsburgh 30,
Pa.

# SHAPER-PLANERS

Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, III.

# SHAPERS

SHAPERS

American Tool Works Co., Pearl and Eggleston Ave., Cincinnati, Ohio.

Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.

Delta Power Tool Div., Rockwell Mfg. Co., 6146 N. Lexington Ave., Pittsburgh B. Pa.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ili.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York Ty, N. Y.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Smith & Mills Shapers, Inc., Div. Hamilton-Thomas Corp., Hamilton, O.
South Bend, Ind.

(Continued on page 424)

PRECISION GEARS for YOUR individual requirements . . . produced promptly to specifications The "Mass Gear" organization specializes in gear design and production. Its facilities can be your Gear Department Smell and making it unnecessary for you to equip Medium Size your shop with special gear-production machinery. You'll find it highly eco-



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# 21,000 tons

of gentle, squeezing power in this





The Verson-Wheelon Bulletin explains the simple operation of the Verson-Wheelon Press and shows examples of the work it performs. Typical specifications are also given. It is available on request. Yes, this Verson-Wheelon Press has a capacity equivalent to a 21,000 ton rubber pad forming press. However, it does a better, more complete forming job than the rubber pad press; yet its cost is only a fraction of that of the conventional press.

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If you are now doing or contemplating rubber pad forming, you should consider a Verson-Wheelon Press before you buy. Compare the price and compare the work—it's the best way to convince yourself of the economy of Verson-Wheelon forming. The bulletin described at the left gives full information. Write for your copy, today.

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MACHINERY, April, 1954-423

# SHAPERS, Vertical

Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y. Pratt & Whitney, West Hartford 1, Conn. Rockford Mch. Tool Co., 2500 Kishwaukee St.,

# SHAPES, Cold Drawn Steel

Columbia Steel & Shafting Co., P.O. Box 1557, Pittsburgh 30, Pa. Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P.O. Box 1557, Pittsburgh 30, Pa.

# SHAPES, Structural

Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center
No. 3 Bldg., Pittsburgh, Pa.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp.
Div. Columbia Steel Co., Div., Tennessee
Coal, Iron & R. R. Co., Div.), 436 7th Ave.,
Pittsburgh, Pa.

# SHEARING MACHINERY

Bethlehem Steel Co., Bethlehem, Pa. Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves.,
Cincinnati, Ohio.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., 3917 St.
Clair Ave, N. E., Cleveland, Ohio.
Cansolidated Mch. Tool Corp., Rochester, N. Y.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 1101 S. Kilburn Ave., Chicago,

III.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Mch. & Tool Works, 683 Northland
Ave., Buffalo, N. Y.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, III. Ryerson, Jos. 1., 4 Chicago 18, III. Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J. Yoder Co., 550 Walworth Ave., Cleveland, Ohio.

# SHEARS, Alligator

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.

# SHEARS, Rotary

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio. Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Punch & Shear Works Co., 3917 St.
Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Niagara Mch. & Tool Works, 683 Northland
Ave., Buffalo, N. Y.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago I8, Ill.
Simonds Saw & Steel Co. (Knives), 470 Main
St., Fitchburg, Mass.
Union Twist Drill Co., Athol, Mass.

# SHEARS, Squaring

Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio. Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio. Columbia Div., Lodge & Shipley Co., Hamilton I, Ohio.

I, Ohio. Consolidated Mch. Tool Corp., Rochester, N. Y. Famco Machine Co., 3134 Sheriden Rd., amco Machine Co., 3134 Sheriaett Ro., Kenosha, Wis. iagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y. monds Saw & Steel Co. (Blades), 470 Main St., Fitchburg, Mass.

American Brass Co., 25 Broadway, New York, N. Y. Bethlehem Steel Co., Bethlehem, Pa. New Jersey Zinc Co., 160 Front St., New York, N. Y.

New Jersey Zinc Co., 100 From 35, 100 From 18, 100 N. Y.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, III.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp. Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave. Pittsburgh, Pa.

# SHEETS, Iron and Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa. Bethlehem Steel Co., Bethlehem, Pa. Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa. Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.

Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, III. U. S. Steel Corp. (Carnegie-Illinois Steel Corp. Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave. Pittsburgh, Pa.

# SHIMS

Laminated Shim Co., Inc., Glenbrook, Conn.

SLEEVES
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland, Ohio.
Greenfield Top & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York, N. Y.,
National Twist Drill & Tool Co., Rochester,
Mich. Greenfield Tap & Die Corp., Greenfield, Mass. Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y. National Twist Drill & Tool Co., Rochester, Mich. Prott & Whitney, West Hartford T, Conn. Scully-Jones & Co., 1903 Rockwell St., Chi-cago 8, III. Union Twist Drill Co., Athol, Mass.

# SLOTTING MACHINES

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio. Consolidated Mch. Tool Corp., Rochester, N. Y. Lobdell United Co., 2000 "G" St., Wilmington 99, Del. Rockford Mch. Tool Co., 2500 Kishwaukee St. pckford Mch. Tool Co., 2500 Kishwaukee St., Rockford, III.

# SOCKETS

SOCKETS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III.

Chicago-Latrobe Twist Drill Wks., 411 W. Ontario St., Chicago, III.

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.

Greenfield Tap & Die Corp., Greenfield, Mass.

National Twist Drill & Tool Co., Rochester, Mich. National Twist Drill & Tool Co., Rochester, Mich., Mich., West Hartford 1, Conn., Scully-Jones & Co., 1903 Rockwell St., Chi-cago 8, III. Union Twist Drill Co., Athol, Mass. Williams, J. H. & Co., 400 Vulcan St., Buffala 7, N. Y.

# SOLDERING UNITS

Wasserlein Mfg. Co., 126 W. Cass St., Joliet,

# SPECIAL MACHINERY AND TOOLS

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Baird Machine Co., 1700 Stratford Ave., Strat-

Ohio.

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.

Baker Bros., Inc., Sta. F., P.O. Box 101, Toledo 10, Ohio.

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Para.

Barnes Drill Co., 814 Chestnut, Rockford, Ill.

Barnes, W. F. & John Co., 201 S. Water St., Rockford, Ill.

Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.

Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.

Bethlehem Steel Co., Bethlehem, Pa.

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.

Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.

Bilanchard Mch. Co., 64 State St., Cambridge, Mass.

Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio.

Bliss, E. Ohio

Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., P.O. Box 37, Harper Sta.,
Detroit 13, Mich.
Columbus Die-Tool & Mch. Co., 955 Cleveland
Ave., Columbus, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Coulter, James, Machine Co., Bridgeport 5,
Conn.

Coulter, James, Machine Co., Bridgeport 5, Conn.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp. 1200 Oakman Blvd., Detroit 32, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.

Detroit, Mich.
Gorton, Geo., Mch. Co. Co., 1110 W. 13th St.,
Racine, Wiz. Gorton, Geo., Mcn. Co. Co.,
Racine, Wis.
Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.
Greenlee Bros. & Co., 12th and Columbia Aves.,
Rockford, III.
Hannifin Corp., 1101 5. Kilbourn Ave., Chicago.
(Continued on page 426)

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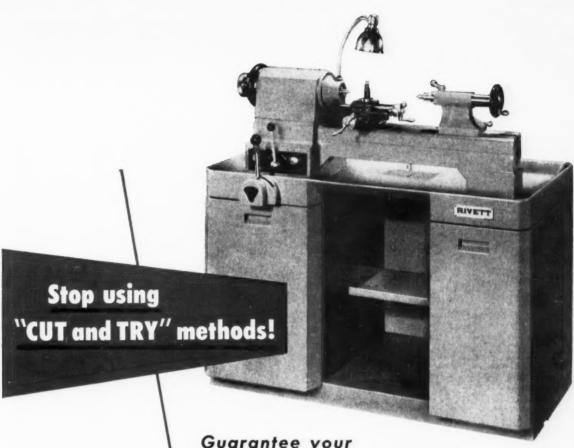


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- Double bevel steel ways, precision ground, provide positive centering action.
  - Collets, with spacing of bearings doubled, have greater precision and gripping power.
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# **RIVETT 918 Steelway Cabinet Lathe**

Snug up to a Rivett 918 and with confidence turn, face or bore to your exacting tolerance—thrill with the knowledge that you are duplicating parts within "tenths".

The speed range and tool rigidity combined with the inherent precision of the 918 assures finish and size—perfect for second operations and toolroom work.

Use a lathe consistent in size with the work to be done—save on the initial expense and continue to save with each piece produced with less effort and without rejection.

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Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, III.
John, B. Manufacturing Co., Ellis St., New Britain, Conn.
Kingsbury Mch. Tool Corp., Keene, N. H.
Lake Erie Engrg. Corp., Kenmore Station, Buftalo, N. Y.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.

St. Louis, Mo. Lipe-Rollway Corp., 806 Emerson Ave., Syra-cuse, N. Y.

St. Louis, Mo.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Michigan Tool Co., 7171 E. McNicholas Rd.,
Detroit 12, Mich.
Modern Industrial Engrg. Co., 14230 Birwood,
Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morgan Engrg. Co., Alliance, Ohio.
Morris Machine Tool Co., Inc., 946-M Harriet
St., Cincinnati 3, Ohio.
Motch Match & Merryweather Mchry. Co.,
Penton Bldg., Cleveland, Oho.
National Acme Co., 170 E. 131st St., Cleveland,
Ohio,
National Automatic Tool Co., Inc. S 7th and
N Sts., Richmond, Ind.
National Broach & Mch. Co., 5600 St. Jean
Ave., Detroit 2, Mich.
National Twist Drill & Tool Co., Rochester
Mich.
New Britain Mch. Co., New Britain-Gridley
Mch. Div., New Britain, Conn.
New Jersey Gear & Mfg. Co., 1470 Chestnut
Ave., Hillside, N. J.
Niagara Mch. & Tool Warks, 683 Northland
Ave., Buffalo, N. Y.
Oilgear Co., 1360 W. Pierce St., Milwaukee 4.
Peerless Production Corp., 19449 Glendole
Ave., Detroit 23, Mich.
Praft & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Turchan Follower Mch. Co., 8259 Livernois &
Alaska Aves., Detroit, Mich.

Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engra, Co., Frankenmuth 2, Mich.
Waltham Machine Works, Newton St., Waltham, Mass.
Wicoco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.
Zagar Tool Co., 24000 Lakeland Blvd., Cleveland 23, Ohio.

# SPEED REDUCERS

Boston Gear Work, 3200 Main St., North Quincy 71 Mass. Brad Foote Gear Works, 1309 S. Cicero Ave., Cicero 50, III. Cleveland Worm & Gear Co., 3249 E. 80th St.,

Cleveland, Ohio.
Cone-Drive Gears, Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
General Electric Co., Schenectady, N. Y., Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.

Ohio.
Perkins Machine & Gear Co., West Springfield,
Mass.
Philadelphia Gear Works, Inc., Erie Ave. and
G St., Philadelphia, Pa.
Twin Disc Clutch Co., 1361 Racine St., Racine,

# SPINDLES, Grinding

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Pope Mchry. Corp., Haverhill, Mass. Taft-Peirce Mfg. Co. Woonsocket, R. I.

# SPINNING LATHES

See Chucking Machines.

# SPROCKET CHAINS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass. Link-Belt Co., 220 S. Belmont Ave., Indian-apolis 6, Ind. Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.

hio. adelphia Gear Works, Inc., Erie Ave. and St., Philadelphia, Pa.

## SPROCKETS

Amgears, Inc., 6633 W. 65th St., Chicago 38, III.
Boston Gear Works, 3200 Main St., North
Quincy 71, Mass.
Hartford Special Mchry. Co., 287 Homestead
St., Hartford, Conn.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philodelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

# STAMPINGS, All Metal

LaSalle Steel Co., Hammond, Ind. Winzeler Mfg. & Tool Co., 1712 West Arcade Pl. Chicago 12, III.

# STAMPINGS, Sheet Metal

Laminated Shim Co., Inc., Glenbrook, Conn. Republic Steel Corp., Niles Steel Products Div., Republic Bldg., Cleveland 1, Ohio. Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y. Winzeler Mfg. & Tool Co., 1712 West Arcade Pl., Chicago 12, III.

STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa. American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio. Bethlehem Steel Co., Bethlehem, Pa. Carpenter Steel Co., Bethlehem, Pa. Carpenter Steel Co., Reading, Pa. Crucible Steel Co., of America, Chrysler Bldg., New York, N. Y. Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa. Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa. National Forge & Ordnance Co., Irvine, Warren County, Pa. Republic Steel Corp., Republic Bldg., Cleveland I., Ohio. Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago IB, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

Chicago 18, III.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Summerill Tubing Co., Div., Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp., Div. Columbia Steel Co., Div. Tennessee Coal, Iron & R. R. Co. Div.), 436 Ave., Pittsburgh, Pa.

A. R. Co. Div.), 436 Ave., Pittsburgh, Pa.
U. S. Steel Supply Div., U. S. Steel Co., 208 S.
LaSalle St., Chicago 4, III.
Wheeler-Lovejoy & Co. Inc., Cambridge, Mass.

# STEEL, Cold Drawn

STEEL, Cold Drawn

Allegheny Ludlum Stell Corp., Pittsburgh, Pa. American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio. Bethlehem Steel Co. & Bethlehem, Pa. Crucibe Steel Co. of America, Chrysler Bldg., New York, N. Y.

Firth Sterling Inc., 3113 Forbes St. Pittsburgh 30, Pa. Jones & Loughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa. Läsalle Steel Corp., Union Drawn Steel Div., Massillon, Ohio.

Ryerson Jos. T., & Son, Inc., 2558 W. 16th St., Cnicago 18, ill.

Summerill Tubing Co. Div. Columbia Steel & Shofting Co., P. O. Box 1557, Pittsburgh 30, Pa.

Timken Roller Bearing Co., Canton, Ohio. U. S. Steel Corp., (American Steel & Wire Co. Div.) 436 7th Ave., Pittsburgh, Pa.

Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

# STEEL, High Speed Tool

STEEL, High Speed Tool
Allegheny Ludium Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 Armstrong
Ave., Chicago, III.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Columbia Tool Steel Co., Lincoln Hwy. & State
St., Chicago Heights, III.
Crucible Steel Co., of America, Chrysler Bldg.,
New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, III.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
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(Continued on page 430)

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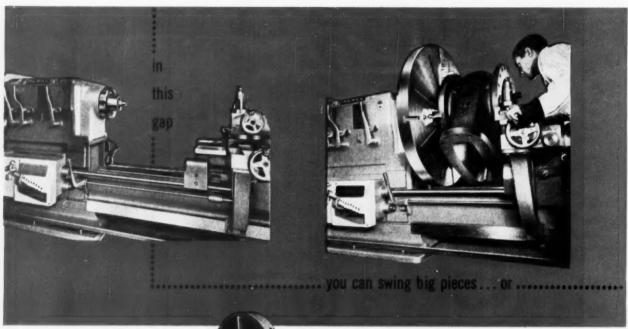
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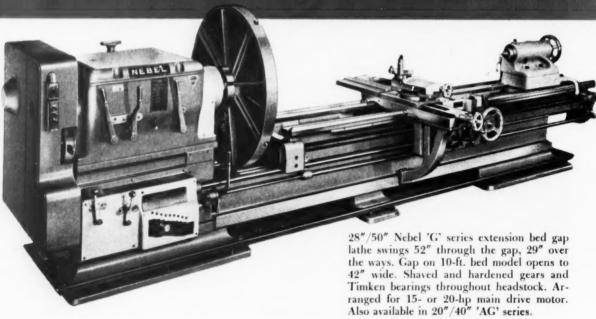
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- \* Removable block gap
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MACHINERY, April, 1954-429

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Crucible Steel Co. of America, Chrysler Bidg.,
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Jones & Laughlin Steel Corp., Gateway Center
No. 3 Bidg., Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Republic Bidg., Cleveland
1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
Wheelock-Lovejoy & Co., Inc., Cambridge,
Mass.

## STEEL, Stainless

STEEL, Stainless
Allegheny Ludium Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel
Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg.,
New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland
1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chaaga 18, III.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co.
Div. Carnegie-Illinois Steel Corp. Div.), 436
Th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge,
Mass.

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Jones & Laughlin Steel Corp., Gateway Center
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Republic Steel Corp., Republic Bldg., Cleveland
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Chicago 18, Ill.
U. S. Steel Corp. (American Steel & Wire Co.
Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Codi, Iron
& R. R. Co. Div.), 436 7th Ave., Pittsburgh,
Pa.

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Republic Steel Corp., Republic Bldg., Cleveland
1, Ohio.
Simonds Saw & Steel Co., 470 Main St., Fitch-burg, Mass.
Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL, Zinc, Tin and Copper Coated Strip Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

## STEEL ALLOYS

See Alloys, Steel

## STEEL BARS

See Bars, Steel

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Haynes Stellite Div., Union Carbide & Carbon Corp. (Alloy), 30 E. 42nd St., New York, N. Y.

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Card, S. W., Mfg. Co., Div. of Union Twist Drill
Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.

# STONES, Oil or Sharpening

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y. Norton Co., 1 New Bond St., Worcester 6,

# STOOLS

Standard Pressed Steel Co., Jenkintown, Pa.

# STRAIGHTEDGES

Starrett, The L. S., Co., Athol, Mass. Taft-Peirce Mfg. Co., Woonsocket, R. I.

# STRAIGHTENERS, Flat Stock and Wire

Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn. U. S. Tool Co., Inc., 255 North 18th St., Am-pere, N. J.

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Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
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Hydraulic Press Mfa. Co.. 300 Lincoln Ave. III.
Hydraulic Press Mfg. Co., 300 Lincoln Ave.,
Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Marse Twist Drill & Mch. Co., New Bedford,
Mass.

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# STUD SETTERS

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# SUB-PRESSES

Waltham Machine Works, Newton St., Wal-tham, Mass.

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See Plates, Surface

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(Continued on page 434)

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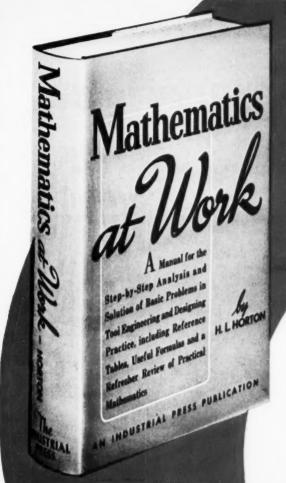
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Scully-Janes & Co., 1903 Rockwell St., Chicago 8, III.

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Toledo 10, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor,
Mich. Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich, Mich, DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. J., N. Y. Etco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y. Jarvis, Chas. L., Co., Middletown, Conn. Leland-Gifford Co., 1025 Southbridge St., Worcesster Mass. cester, Mass. McCrosky Tool Corp., 1938 Thomas St., Mead-ville, Pa. ville, Pa.

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Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.

Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

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Conn. Conn. Buffalo Forge Co., 490 Broadway, Buffalo, Buhr Mich. Mch. Tool Co., 835 Green St., Ann Arbor, Challenge Mchry, Co., Grand Haven, Mich. Cleveland Tapping Machine Co., Canton 6, Cleveland Tapsing Machine Co., Canton 6, Ohio.

Cleveland Tapsing Machine Co., Canton 6, Ohio.

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Besly-Welles Corp., Beloit, Wis.
Butterfield Div., Union Twist Drill Co., Derby
Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill
Co., Mansfield, Mass.
Continental Tool Works, Div. Ex-Cell-O. Corp.,
Detroit 32, Mich.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd.,
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Haven 15, Conn.

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Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
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Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y. 32, Mich. Ilows Gear Shaper Co., 78 River St., Spring-

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See Gages, Thread.

# THREAD GRINDING MACHINES

See Grinding Machines, Thread

# THREAD MILLING MACHINES Coulter, James, Machine Co., Bridgeport 5,

Conn.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Hanson-Whitney Co., Div. Whitney Chain Co.,
Hartford, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Waltham Machine Works, Newton St., Wal-Waltham Mac tham, Mass.

# THREAD ROLLING MACHINES

Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn. Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio. Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.

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Div., Columbia Steel Co. Div. Tennessee
Coal Iron & R. R. Co., Div.), 436 7th Ave.,
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TOOL' BITS, High Speed Steel

TOOL' BITS, High Speed Steel
Allegheny Ludlum Steel Corp., Pittsburgh. Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong
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Crucible Steel Co. of America, Chrysler Bldg.,
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TOOL BITS, Special Alloy

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Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
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Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Vesson Co., 1220 Woodward Heights Blvd.,
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See Grinding Machines for Sharpening, Turning and Planning Tools.

# TOOL GRINDING ATTACHMENTS

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Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich. Burg Tool Mfg. Co., 3743 Durango Ave., Los Angeles 34, Cal.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Loc, Wis. Maxwell Co., 420 Broadway, Bedford, Ohio. Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
Milholland, W. K., Mchry. Co., 6402 Westfield Blyd., Indianapolis 5, Ind., OK Tool Co., Milford, N. H.
Portage Double Quick Tool Co., 1063 Sweitzer Aye., Akron 11, Ohio.
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, III. (Turret)
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Western Tool & Mfg. Co., 1640 Wheeler St., Springfield, Ohio.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

TOOLMAKERS' INSTRUMENTS

TOOLMAKERS' INSTRUMENTS

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Starrett, The L. S. Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I. (Continued on page 436)

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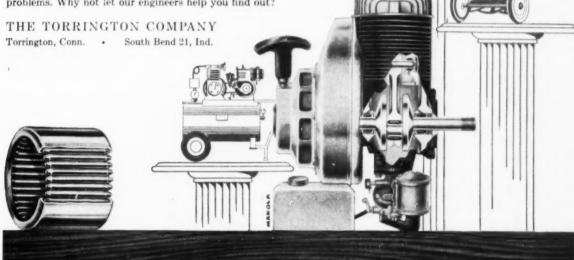
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DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.

1, Ohio. Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, III. Vanadium Alfoys Steel Co., Latrobe, Pa.

TOOLS, Carbide-Tipped

TOOLS, Carbide-Tipped
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Atrax Co., Newington, Corn., Beaver Tool & Engineering Corp., 2850
Rochester Rd., Box 429, Royal Oak, Mich.
Carboloy Dept., General Electric Co., Box 237,
Roosevell Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W.
Ontario St., Chicago, Ill.
Cleveland Twist Brill Co., 1242 E. 49th St.,
Cleveland, Ohio.
Colonial Broach Co., Detroit 13, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh Pa. ng Tool Co., 21225 Hoover Rd., Detroit Gairing Too 32, Mich Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Kennametal, Inc., Latrobe, Pa. Maxwell Co., 420 Broadway, Bedford, Ohio McCrosky Tool Corp., 1938 Thomas St., Meadwille, Pa.
Metal Carbides Corp., Youngstown, Ohio. Newcomer Products, Latrobe, Pa.
OK Tool Co., Milford, N. H.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndole, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

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TOOLS, Lathe, Shaper and Planer
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Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn. Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich. Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Detroit, Mich.
Malpern, Wm., Co., Inc., 100 Stevens Ave., Mt. Vernon, N. Y.
Havnes Stellite Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
OK Tool Co., Milford, N. H.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Super Tool Co., 21650 Hoover Road, Detroit 13, Mich.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, Ohio.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

# TRANSFER MACHINES, Automotic

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Barnes, W. F. & John, Co., 201 S. Water St.,
Rockford, III.
Colonial Broach Co., P. O. Box 37, Harper
Sta., Detroit 13, Mich.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Peerless Production Corp., 19449 Glendale
Ave., Detroit 23, Mich.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, III.

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General Electric Co., Schenectady, N. Y.

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# TUBE FORMING AND WELDING

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Yoder Co., 550 Walworth Ave., Cleveland.

# TUBE MILLS

Abbey-Etna Co., 2422 Maplewood Ave., Toledo 10, Ohio.

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# TUBING, Flexible

merican Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y.

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TUBING, Steel
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Carpenter Steel Co., Reading, Pa.
Jones & Laughlin Steel Corp., Gateway Center
No. 3 Bldg., Pittsburgh, Pa.
National Tube Div. U. S. Steel Corp., 525 Wm.
Penn Place, Pittsburgh, Pa.
Republic Steel Corp., Steel Tubes Div., Republic Steel Corp., Steel & Tubes Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, Ill.
Summerill Tubing Co., Div. Columbia Steel &
Shafting Co., P. O. Box 1557, Pittsburgh
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Timken Roller Bearing Co., Canton, Ohio.

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Lehigh Foundries, Inc., 1500 Lehigh Dr.,
Easton, Pa.
Mead Specialties Co., 4114 North Knox Ave.,
Chicago 41, III.
Rivett Lathe & Grinder, Inc., Brighton, Boston
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Ross Operating Valve Co., 120 E. Golden Gate,
Detroit, Mich.

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American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio. Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
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Denison Engrg. Co., 1160 Dublin St., Columbus
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Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, III.
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Hydraulic Press Mfg. Co., 300 Lincoln Ave.,
Mt. Gilead, Ohio.
Lehigh Foundries, Inc., 1500 Lehigh Dr.
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Lehigh Foundries, Inc., 1500 Lehigh Dr.
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Oilgear Co., 1560 W. Pierce St., Milwaukee 4.
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Vickers, Inc., 1402 Oakman Blvd., Detroit,
Mich.
Watson-Stillman Co., Div. H. K. Porter Co.,
Inc., Roselle, N. J.

# VIBRATION INSULATION

American Felt Co., Glenville, Conn.

# VISES, Machine

VISES, Machine

Armstrong-Blum Mtg. Co., 5700 W. Blooming-dale Ave., Chicago, III.

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III.

Brown & Sharpe Mtg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mtg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.

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Prioducto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.

Skinner Chuck Co., 344 Church St., New Britain, Conn. Skinner Chuck. Co., 344 Church St., New Brit-ain, Conn. South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind. Universal Engineering Co., Frankenmuth 2, Mich.

# VISES, Pipe

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# VISES, Planer and Shaper

Visto, Pianer and Snaper
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Cincinnati Shaper Co., Elam and Garrard
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Skinner Chuck Co., 344 Church St., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison
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# **VISES, Pneumatic**

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# **VOLTMETERS**

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# WASHERS, Lock

Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E., Massillon, Ohio.

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(Continued on page 438)



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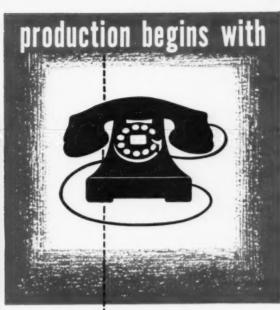
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Butt, Seam, Etc.

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Delta Power Tool Div., Rockwell Mtg. Co., 6146 N. Lexington Ave., Pittsburgh 8, Pa.

Expert Welding Machine Co., 17144 Mt. Elliott Ave., Detroit 12, Mich.

Federal Machine & Welder Co., Warren, Ohio.

## WELDMENTS

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American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio. Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.

Bethlehem Steel Co., Bethlehem, Pa. Republic Steel Corp., Republic Bldg., Cleveland 1 Ohio. U. S. Steel Corp., (American Steel & Wire Co. Div. Columbia Steel Co. Div., Tennessee Coal Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

# WIRE FORMING MACHINERY

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Nilson A. H. Mch. Co., 1506 Railroad Ave.,
Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

# WIRE NAIL MACHINERY

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Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, III.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

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# WRENCHES, Pipe

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III.

# WRENCHES, Ratchet

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Keller Tool Co., Grand Haven, Mich. Williams, J. H. & Co., 400 Vlucan St., Buffalo 7, N.Y.

# WRENCHES, Top

Butterfield Div., Union Twist Drill Co., Derby Butterfield Div., Crimon Twist Drill Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney, West Hartford, Conn.

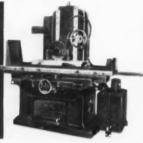
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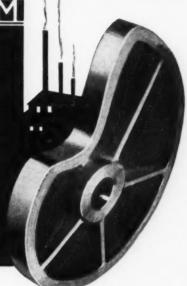


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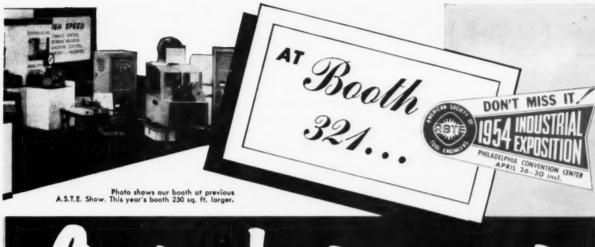
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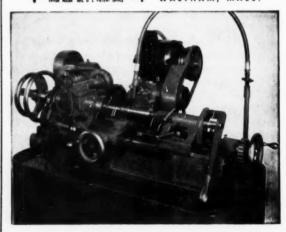
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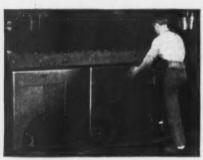
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Smooth curves of practically any shape can be readily formed with standard or simple dies.



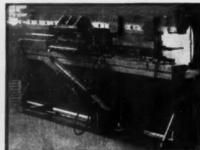
Various beading and edging operations are easily performed. Here the edge of a panel is being wrapped around a pipe for rigidity.



Producing a 6-inch diameter cylinder. Parts like this can be formed in lengths up to 20 feet.



Punching 150 holes ranging from .078" to .250" at one time is easily done on a Steel-weld Press.



Holes are punched, corners notched and the plate finally formed with dies shown. See finished part at left.



For production runs, several forming and punching operations may be handled at each stroke of the ram.

PRESSES

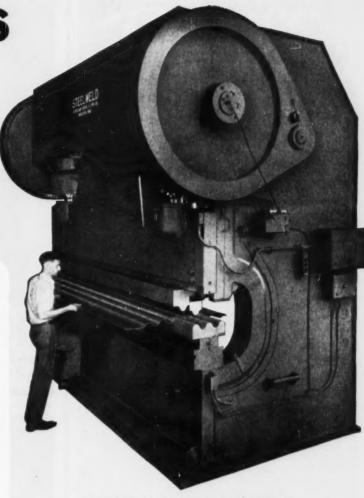
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Steelweld Presses are versatile. Any of the various operations illustrated, at left are easily performed on any machine.

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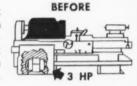
# -Saves Thousands

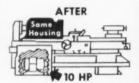
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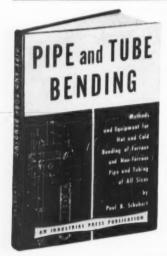
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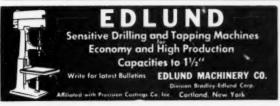
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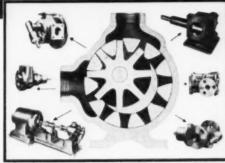




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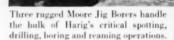
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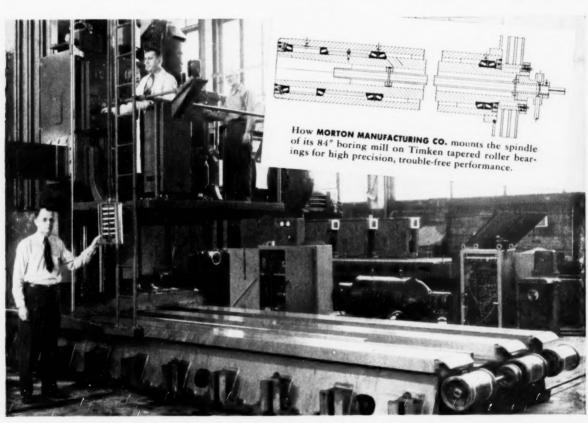
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